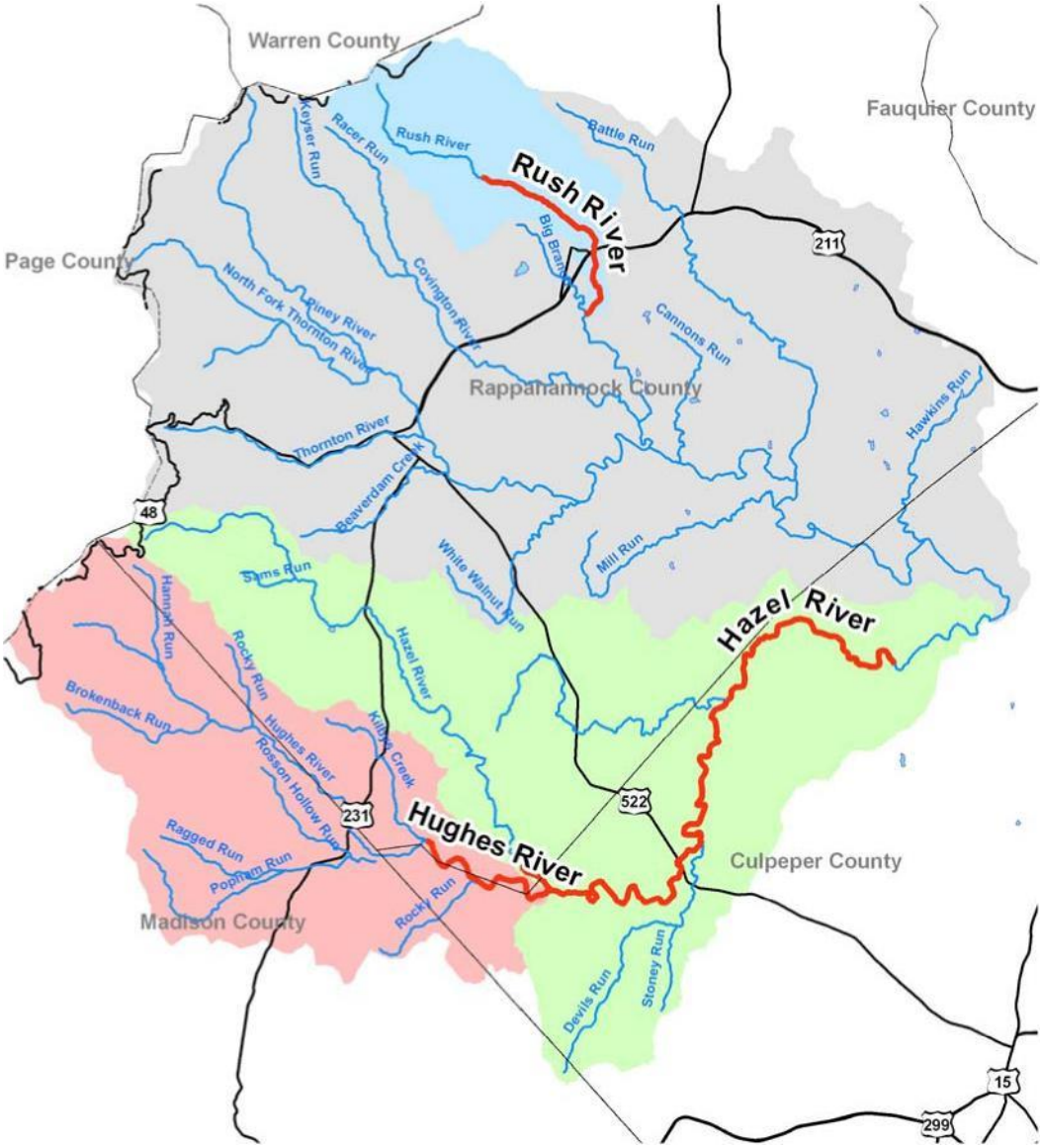
Upper Hazel River
Bacteria Total Maximum Daily Load
Plan Technical Report



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1. EXECUTIVE SUMMARY

Introduction

The Virginia Total Maximum Daily Load program is a process to restore impaired waters in Virginia. Specifically, TMDL is the maximum amount of pollutant that a waterbody can assimilate without surpassing the state water quality standards for protection of the five beneficial uses: drinking water, recreational (*i.e.*, primary contact/swimming), fishing, shellfishing, and aquatic life. If the water body surpasses the water quality standard during an assessment period, Section 303(d) of the Clean Water Act and the United States Environmental Protection Agency's Water Quality Management and Planning Regulation (40 CFR Part 130) both require that states develop a total maximum daily load for each pollutant.

Bacteria Total Maximum Daily Loads have been developed for the Hughes River, Rush River, and Hazel River (VAN-E04R-01) impairments. After these Total Maximum Daily Loads were developed, the Thornton River and Battle Run were listed as impaired due to exceedances of the bacteria water quality standard. These watersheds drain to the Hazel River (60076) impairment watershed, and were assigned load reductions as part of Total Maximum Daily Load development for the Hazel River (60076) impairment. Since Total Maximum Daily Load reductions were specified for the Thornton River watershed, it was included as part of the Upper Hazel River Total Maximum Daily Load Implementation Plan. The Rush River and Hazel River were initially placed on the Commonwealth of Virginia's Section 303(d) List of Impaired Waters in 2002 for exceedances of the bacteria standard and remained on the 2004 Section 303(d) Total Maximum Daily Load Priority List and Report (VADEQ, 2004) and the 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard. Hughes River was initially listed as impaired stream on Virginia's 2004 Section 303(d) List (VADEQ, 2004) and remained on the 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard.

The Total Maximum Daily Load set limits on the amount of bacteria these rivers can tolerate and still maintain support of the Recreational Use. After the Total Maximum Daily Load study is complete and approved by USEPA, Virginia's 1997 Water Quality Monitoring, Information and Restoration Act states in section 62.1-44.19:7 that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters". To comply with this state requirement, a Total Maximum Daily Load implementation plan was formulated to reduce bacteria levels to attain water quality standards enabling delisting of stream from the Section 303(d) List of Impaired Waters. The Total Maximum Daily Load implementation plan describes control measures, which can include the use of better treatment technology and the installation of best management practices, to be implemented in a staged process. Successful completion and local support of the implementation plan will enable restoration of the impaired waters while enhancing the value of this important resource for the Commonwealth. Opportunities for Madison, Rappahannock, and Culpeper Counties; local agencies; and watershed residents to obtain funding will improve with an approved implementation plan.

Key components of the implementation plan are discussed in the following sections:

- Review of TMDL Development Study,
- Public Participation,
- Implementation Actions,

- Measurable Goals and Milestones for Attaining Water Quality Standards,
- Stakeholder's Roles and Responsibilities,
- Integration with Other Watershed Plans, and
- Potential Funding Sources.

Review of TMDL Study

Impairment description, water quality monitoring, watershed description, source assessment, water quality modeling, and allocated reductions were reviewed to determine implications of Total Maximum Daily Load and modeling procedures on implementation plan development. Conditions outlined in the TMDL development study to address bacteria impairments in the Upper Hazel River watershed include:

- Exclusion of most/all livestock including horses from streams is necessary;
- Substantial land-based NPS load reductions are called for on pasture and cropland;
- All straight pipes and failing septic systems need to be identified and corrected;
- Implicit in the requirement to correct straight pipes and failing septic systems is the requirement to maintain all properly functioning septic systems;
- Reductions of pet bacteria loads on residential land use are necessary; and
- Implicit in the requirement for no point source bacteria load adjustment is the requirement for point sources to maintain permit compliance.

Public Participation

The actions and commitments compiled in this document are formulated through input from citizens of the watershed; Culpeper, Madison, and Rappahannock County governments; Culpeper Soil and Water Conservation District; Virginia Department of Conservation and Recreation; Virginia Department of Environmental Quality; Virginia Department of Health; Virginia Department of Forestry; Virginia Cooperative Extension; National Park Service; Rappahannock-Rapidan Regional Commission; RappFLOW; Piedmont Environmental Council; Friends of the Rappahannock; and Engineering Concepts, Inc. Every citizen and interested party in the watershed is encouraged to put the IP into action and contribute what he or she is able to help restore the health of the streams.

Public participation took place during implementation plan development on three levels. First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project, as well as, a forum for soliciting participation in the smaller, more-targeted meetings (*i.e.*, working groups and Steering Committee). Second, working groups were assembled from communities of people with common concerns regarding the implementation process and were the primary arena for seeking public input. Three working groups were formed: Agricultural, Residential, and Governmental. A representative from Virginia Department of Conservation and Recreation, Rappahannock-Rapidan Regional Commission, or Engineering Concepts, Inc. coordinated each working group in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from the Agricultural, Residential, and Governmental Working Groups; Culpeper, Madison, and Rappahannock County governments; Culpeper Soil and Water Conservation District; Virginia Department of Conservation and Recreation; Virginia Department of Environmental Quality; Virginia Department of Health; Virginia Cooperative Extension; Rappahannock-Rapidan Regional Commission; National Park Service; RappFLOW;

Friends of the Rappahannock; and Engineering Concepts, Inc. to guide the development of the implementation plan. Over 500 man-hours were devoted to attending these meetings by individuals representing agricultural, residential, commercial, environmental, and government interests on a local, state, and federal level. Throughout the public participation process, major emphasis was placed on discussing best management practices (BMPs), locations of control measures, education, technical assistance, monitoring, and funding.

Implementation Actions

The actions and cost needed in both implementation stages were identified and quantified. The overall numbers presented represent the Stage II goal of TMDL source allocation attainment (*i.e.*, no water quality standard exceedance), which is required under WQMIRA and by USEPA for eligibility to receive Section 319 grant funds to apply during implementation. An assessment was also conducted to quantify actions and cost to meet source allocations that translate to an instantaneous standard violation rate of 10% or less resulting in removal of the Hughes River, Hazel River, and Rush River from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. This is referred to as the Stage I implementation goal.

The quantity of control measures, or BMPs, required during implementation was determined through spatial analyses of land use, stream-network, and the Commonwealth of Virginia aerial maps along with regionally appropriate data archived in the VADCR Agricultural BMP Database and TMDL Development documents. The map layers and archived data were combined to establish average estimates of control measures required overall and in each watershed. Additionally, input from local agency representatives, citizens, and contractors were used to verify the analyses. Estimates of control practices needed for full implementation in the Upper Hazel River watershed are as follows:

- 1,072 Livestock Exclusion Systems
- 53,621 Acres in Pasture Management Systems
- 283 Acres of Cropland converted to Vegetative Buffers
- 283 Acres of Cropland converted to Forested Buffers
- 569 Acres of Cropland with Manure / Biosolids Incorporation into soil
- 5,419 Acres of Pasture Treated by Retention Ponds
- 777 New Septic Systems
- 439 Repaired Septic Systems
- 130 Alternative Sewage Disposal Systems
- 4 Pet Waste Management Programs
- 1,908 Pet Waste Enzyme Digesting Composters
- 12 Confined Canine Unit Treatment Systems
- 510 Acres of Residential Land Use Treated by Vegetative Buffers
- 60 Agricultural Technical Assistance Full Time Equivalents
- 20 Residential Technical Assistance Full Time Equivalents

The primary benefit of implementation is cleaner waters in Virginia, where bacteria levels in the Upper Hazel River watershed will be reduced to meet water quality standards, benefiting human health, livestock herd health, stakeholder economy, and aquatic community. It is hard to gauge

the impact that reducing fecal contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, the incidence of infection from fecal sources, through contact with surface waters, should be reduced considerably. An important objective of the IP will be to foster continued economic vitality and strength. Healthy waters can improve economic opportunities for Virginians, and a healthy economic base can provide the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the landowner, along with the expected environmental benefits on-site and downstream. Improved aesthetics in public areas (*e.g.*, parks) and surrounding businesses provided by control measures (*e.g.*, pet waste kiosks and bioretention) has the potential to draw local citizens and visitors to these areas and a healthy waterway has the potential to attract local citizens and visitors for recreation. Additionally, money spent on materials and technical assistance resources by landowners, government agencies, and non-profit organizations in the process of implementing the implementation plan will stimulate the local economy.

Measurable Goals and Milestones for Attaining Water Quality Standards

The end goals of implementation are restored water quality in the impaired waters and subsequent de-listing of streams from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. Progress toward end goals will be assessed during implementation through tracking of control measure installations by Culpeper Soil and Water Conservation District; Natural Resources Conservation Service; Virginia Department of Health, Virginia Department of Conservation and Recreation; Culpeper, Madison, and Rappahannock Counties; Town of Washington; and Rappahannock-Rapidan Regional Commission. The Virginia Department of Environmental Quality will continue to assess water quality through its monitoring program. Other monitoring project activities in the watershed (*e.g.*, RappFLOW) will be coordinated to augment the Virginia Department of Environmental Quality monitoring program. Implementation will be assessed based on reducing exceedances of the bacteria water quality standard to improve water quality resulting in removal of Hughes River, Hazel River, and Rush River from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters.

Implementation of control measures is scheduled for 10 years and will be assessed in two stages. Stage I is based on meeting source allocations that translate to an instantaneous standard exceedance rate of 10% or less resulting in removal of Hughes River, Hazel River, and Rush River from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. The Stage II goal is based on implementing source allocations to meet the specified TMDL goal, 0% exceedance of water quality standards. Implementation of control measures is scheduled to begin in July 2009 lasting to June 2019. After implementation inception, three milestones will be met in Stage I and two milestones in Stage II.

Implementation in years one through six for agricultural source reductions focuses on livestock exclusion and pasture management systems. BMPs installed in years seven through ten are based on additional livestock exclusion, additional treatment of runoff from pasture land using retention ponds to remove remaining bacteria load not treated with the pasture management systems installed during Stages I and II, cropland conversion, and manure / biosolids incorporation into soil. Retention ponds are more costly and are logistically more difficult to

design and locate on individual farms. Implementation in years one through six for residential bacteria loads focuses on identification and removal of straight pipes, repairing or replacing failing septic systems, a pet waste control program, installation of pet waste enzyme digesting composters, and installation of treatment systems for waste from confined canine units (CCU). Implementation of these control measures will continue in years seven through ten if needed in addition to installing vegetated buffers.

Water quality improvement is expected to increase each year. An 18.3% overall bacteria load reduction is expected at the second year, 36.7% in the fourth year, and 56.7% in the sixth year. Based on water quality modeling projections for the sixth year (Milestone 3), the Hughes River, Hazel River, and Rush River would be in a probable position to be de-listed from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. Considering the dynamics of a stream ecosystem and the inherent difficulties that may arise preventing BMP implementation, the final milestone of TMDL allocation attainment was set at 10 years following implementation commencement.

The process of a staged implementation implies targeting of control measures, ensuring optimum utilization of resources. In quantifying agricultural BMPs through the use of aerial, land use, and stream network GIS layers, maps were formulated showing potential livestock access, pastureland, and crop fields. These maps identify farm tracts that CSWCD should concentrate their efforts in. The district will coordinate with landowners and track BMP installation progress. Known problem areas, clusters of older homes, or houses in close proximity to streams known by the Virginia Department of Health will be targeted for onsite treatment system control measures. Steps outlined in pet waste BMP stages results in targeting of source type and resources.

Stakeholder's Roles and Responsibilities

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals, and special interest groups. Successful implementation depends on stakeholders taking responsibility for their role in the process, and the primary role falls on the local groups that are most affected; that is, businesses, community watershed groups, and citizens. However, local, state, and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. Stakeholder participation and support is essential for achieving the goals of this Total Maximum Daily Load effort (*i.e.*, improving water quality and removing streams from the impaired waters list). It must first be acknowledged that there is a water quality problem, and changes must be made as needed in operations, programs, and legislation to address these pollutants. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions.

The agencies regulating activities that impact water quality in Virginia include: Virginia Department of Environmental Quality, Virginia Department of Conservation and Recreation, Virginia Department of Agriculture and Consumer Services, Virginia Department of Game and Inland Fisheries, Virginia Department of Health, Virginia Department of Forestry, and Virginia Cooperative Extension. The Culpeper Soil and Water Conservation District is a local unit of government responsible for the soil and water conservation work within Greene, Culpeper,

Madison, Orange, and Rappahannock Counties. The district's overall role is to increase voluntary conservation practices among farmers, ranchers, and other land users. Specific to the Total Maximum Daily Load implementation, the district will lead education and technical assistance efforts and track best management practice implementation for the agricultural and onsite sewage disposal systems. The Rappahannock-Rapidan Regional Commission promotes efficient development of the environment by assisting and encouraging local governmental agencies to plan for the future. Rappahannock-Rapidan Regional Commission will lead the pet waste management implementation with assistance from localities and Culpeper Soil and Water Conservation District. Additionally, Rappahannock-Rapidan Regional Commission will continue to work with Virginia Department of Conservation and Recreation and the Steering Committee to periodically revisit implementation progress and suggest plan revisions as needed.

Integration with Other Watershed Plans

Each watershed within the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographical boundaries and goals. These include but are not limited to, the Chesapeake Bay 2000 agreement, Tributary Nutrient Reduction Plans, TMDLs, Roundtables, Water Quality Management Plans, Erosion and Sediment Control regulations, Stormwater Management Program, Source Water Assessment Program, and local comprehensive plans. In some cases, an implementation plan may even address multiple TMDLs (*e.g.*, bacteria and benthic) for the same impaired water body. The progress of these projects or programs needs continuous evaluation to determine possible effects on implementation goals. For example, financial and technical resources may be maximized for implementation by coordinating and expanding the planning and implementation activities of these on-going watershed projects or programs. Current initiatives within Town of Washington and Culpeper, Madison, and Rappahannock Counties to be integrated with the Upper Hazel River Total Maximum Daily Load Implementation Plan include:

- Culpeper, Madison, and Rappahannock Counties Comprehensive Plans
- Town of Washington Comprehensive Plan
- Culpeper Soil and Water Conservation District Septic System Program
- Town of Washington Waste Water Treatment Plant Construction
- Rappahannock County and Madison County Easement Programs
- Madison County Asset Mapping Project
- RappFLOW Strategic Plan
- Friends of the Rappahannock Strategic Plan
- The Hughes River Partnership Strategic Plan
- Rappahannock League for Environmental Protection Strategic Plan
- Piedmont Environmental Council Strategic Plan

Potential Funding Sources

Potential funding sources available during implementation were identified in the course of plan development. Detailed description of each source (*i.e.*, eligibility requirements, specifications, incentive payments) can be obtained from the Culpeper Soil and Water Conservation District, Virginia Department of Conservation and Recreation, Virginia Department of Environmental Quality, Virginia Department of Game and Inland Fisheries, Virginia Cooperative Extension,

Virginia Department of Health, and Natural Resources Conservation Service. Potential funding sources include:

- Federal Clean Water Act Section 319 Incremental Funds
- U.S. Department of Agriculture Conservation Reserve Enhancement Program, Conservation Reserve Program, Environmental Quality Incentives Program, Wetland Reserve Program, and Wildlife Habitat Incentive Program
- U.S. Fish and Wildlife Service Conservation Grants and Private Stewardship Programs
- National Fish and Wildlife Foundation
- Chesapeake Bay Small Watershed Grants Program
- Virginia Agricultural Best Management Practices Cost-Share and Tax Credit Programs
- Virginia Water Quality Improvement Fund
- Virginia Small Business Environmental Compliance Assistance Fund
- Virginia Landowner Incentive Program
- Community Development Block Grant Program
- Rural Community Assistance Program
- Southeast Rural Community Assistance Project
- Chesapeake Bay Foundation
- Krebser Foundation
- Piedmont Environmental Council
- Friends of the Rappahannock

2. INTRODUCTION

2.1 Background

The Virginia Total Maximum Daily Load (TMDL) program is a process to restore impaired waters in Virginia. Specifically, TMDL is the maximum amount of pollutant that a water body can assimilate without surpassing the state water quality standards for protection of the five beneficial uses: drinking water, recreational (i.e., primary contact/swimming), fishing, shellfishing, and aquatic life. If the water body surpasses the water quality criteria during an assessment period, Section 303(d) of the Clean Water Act (CWA) and the United States Environmental Protection Agency's (USEPA) Water Quality Management and Planning Regulation (40 CFR Part 130) both require that states develop a TMDL for each pollutant.

Bacteria TMDLs have been developed for the Hughes River, Rush River, and Hazel River (VAN-E04R-01) impairments. After these TMDLs were developed, the Thornton River and Battle Run were listed as impaired due to exceedances of the bacteria water quality standard. These watersheds drain to the Hazel River (60076) impairment watershed, and were assigned load reductions as part of TMDL development for the Hazel River (60076) impairment. Since TMDL reductions were specified for the Thornton River watershed, it was included as part of the Upper Hazel River TMDL Implementation Plan.

Rush River and Hazel River were initially placed on the Commonwealth of Virginia's Section 303(d) List of Impaired Waters in 2002 for exceedances of the bacteria standard and remained on the 2004 Section 303(d) TMDL Priority List and Report (VADEQ, 2004) and the 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard. Hughes River was initially listed as impaired stream on Virginia's 2004 Section 303(d) List (VADEQ, 2004) and remained on the 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard.

The TMDL set limits on the amount of bacteria these rivers can tolerate and still maintain support of the Recreational Use. After the TMDL study is complete and approved by USEPA, Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) states in section 62.1-44.19:7 that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters".

To comply with this state requirement, a TMDL implementation plan (IP) was developed to reduce bacteria levels to attain water quality standards allowing delisting of stream from the Section 303(d) List of Impaired Waters. The TMDL IP describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in a staged process. Successful completion and local support of the implementation plan will enable restoration of the impaired waters while enhancing the value of this important resource for the Commonwealth. Opportunities for Madison, Rappahannock, and Culpeper Counties, local agencies, and watershed residents to obtain funding will improve with an approved IP.

2.2 Project Methodology

The overall goal of this project was to begin the process of restoring water quality in the Upper Hazel River watershed. Specific objectives in meeting this goal were:

1. Development of a staged IP for the watershed;
2. Coordination of public participation; and
3. Implementation of control measures.

Key components of the implementation plan are discussed in the following sections:

- Review of TMDL Development Study,
- Public Participation,
- Implementation Actions,
- Measurable Goals and Milestones for Attaining Water Quality Standards,
- Stakeholder's Roles and Responsibilities,
- Integration with Other Watershed Plans, and
- Potential Funding Sources.

Public participation was an integral part in developing the IP and is critical to promote reasonable assurance that the implementation actions will occur. Public participation took place during IP development on three levels. First, public meetings were held to inform the public of project end goals and status of the project, as well as, a forum for soliciting participation in the smaller, more-targeted meetings (i.e., working groups and Steering Committee). Second, working groups were assembled from communities of people with common interests and concerns regarding implementation process and were the primary arena for seeking public input. Agricultural, Residential, and Governmental working groups were formed. A representative from Virginia Department of Conservation and Recreation (VADCR), Rappahannock-Rapidan Regional Commission (RRRC), or Engineering Concepts, Inc. (ECI) coordinated each working group in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from the Agricultural, Residential, and Governmental Working Groups; Culpeper, Madison, and Rappahannock County governments; Culpeper Soil and Water Conservation District (CSWCD); VADCR; Virginia Department of Environmental Quality (VADEQ); Virginia Department of Game and Inland Fisheries (VDGIF); Virginia Department of Health (VDH), Virginia Department of Forestry (VDOF); Virginia Cooperative Extension (VCE); National Park Service (NPS); RappFLOW; RRRC; and ECI to guide the development of the IP.

Potential control measures, their associated costs and efficiencies, and potential funding sources were identified through review of the TMDL, input from working groups and Steering Committee, literature review, and discussion with CSWCD and VDH. Implementation actions that can be promoted through existing programs were identified, as well as actions not currently supported by existing programs and their potential funding sources. Control measures were assessed based on cost, availability of existing funds, reasonable assurance of implementation, and water quality impacts.

The quantity of control measures, or BMPs, recommended during implementation was determined through spatial analyses and modeling alternative implementation scenarios. Spatial analyses of land use, stream-network, farm tracts, and the Commonwealth of Virginia aerial

maps along with regionally appropriate data archived in the VADCR Agricultural BMP Database were combined to establish average estimates of control measures to reduce bacterial loads on pasture and cropland land uses. Additionally, input from local agency representatives, citizens, and contractors were used to verify the analyses. Overall numbers represent the Stage II goal of TMDL source allocation attainment, which is required under WQMIRA and by USEPA for eligibility to receive Section 319 grant funds to apply during implementation. An assessment was also conducted to quantify actions and cost to meet source allocations that translate to an instantaneous standard violation rate of 10% or less resulting in removal of Hughes River, Rush River, and Hazel River from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. This is referred to as the Stage I implementation goal.

The assessment of water quality impacts consisted of the development and evaluation of implementation scenarios. Implemental strategies were presented to and evaluated by the steering committee. Based on the evaluated strategies, a staged implementation timeline was developed. Implicit in the process of a staged implementation is targeting of control measures. Targeting was proposed to ensure optimum utilization of resources. Modeling was used to evaluate measurable goals and milestones by linking water quality with specific levels of implementation (e.g., 100% reduction in straight pipes may result in a 10% reduction in violations of the instantaneous bacteria water quality standard). Through this process, a staged implementation plan was developed that will establish full implementation within 10 years.

3. STATE AND FEDERAL REQUIREMENTS FOR IMPLEMENTATION PLANS

In developing this implementation plan, both state and federal requirements and recommendations were followed. Virginia's 1997 WQMIRA directs the State Water Control Board (SWCB) to "develop and implement a plan to achieve fully supporting status for impaired waters" (§62.1-44.19:4 through 19:8 of the Code of Virginia). WQMIRA establishes that the implementation plan shall include the date of expected achievement of water quality objectives, measurable goals, corrective actions necessary and the associated costs, benefits, and environmental impacts of addressing the impairments.

Section 303(d) of the CWA and current USEPA regulations do not require the development of implementation strategies. USEPA does, however, outline the minimum elements of an approvable IP in its 1999 "Guidance for Water Quality-Based Decisions: The TMDL Process". The listed elements include description of the implementation actions and management measures, timeline for implementing these measures, legal or regulatory controls, time required to attain water quality standards, monitoring plan, and milestones for attaining water quality standards.

USEPA develops guidelines that describe the process and criteria to be used to award CWA Section 319 nonpoint source grants to States. The guidance is subject to revision and the most recent version should be considered during implementation. The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine elements that must be included in the IP to meet the Section 319 requirements:

1. Identify the causes and sources of groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan;
2. Estimate the load reductions expected to achieve water quality standards;
3. Describe the NPS management measures that will need to be implemented to achieve the identified load reductions;
4. Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan;
5. Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures;
6. Provide a schedule for implementing the NPS management measures identified in the watershed-based plan;
7. Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented;
8. Identify a set of criteria for determining if loading reductions are being achieved and progress is being made towards attaining water quality standards, and if not, the criteria for determining if the watershed-based plan needs to be revised; and

9. Establish a monitoring component to evaluate the effectiveness of the implementation efforts.

The process of incorporating these state and federal guidelines into an IP consisted of three major components: 1) public participation, 2) implementation actions, and 3) measurable goals and milestones.

Once developed, VADEQ will present the IP to the SWCB for approval as the plan for implementing pollutant allocations and reductions contained in the TMDLs. In addition, VADEQ will request the plan be included in the appropriate Water Quality Management Plan (WQMP), in accordance with the CWA's Section 303(e) and Virginia's Public Participation Guidelines for Water Quality Management Planning. In response to a Memorandum of Understanding (MOU) between USEPA and VADEQ, VADEQ also submitted a draft Continuous Planning Process to USEPA in which VADEQ commits to regularly updating the WQMPs. Thus, the WQMPs will be, among other things, the repository for all TMDLs and TMDL IPs developed within a river basin.

3.1 Designated Uses

The "Designation of Uses" of all waters in Virginia is defined in the Code of Virginia (9 VAC 25-260-10) as follows:

"A. All state waters are designated for the following uses: recreational uses (e.g., swimming and boating); the propagation and growth of a balanced indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish)."

The goal of the CWA is that all streams should be suitable for recreational uses, including swimming and fishing. **Fecal coliform and *E. coli* bacteria** are used to indicate the presence of pathogens in streams supporting the **swimmable use goal**. Bacteria in the Hughes River, Rush River, Thornton River, and Hazel River exceed the fecal coliform criterion.

4. REVIEW OF TMDL DEVELOPMENT STUDY

Rappahannock Rapidan Regional Commission (RRRC) and Engineering Concepts, Inc. (ECI) were contracted by VADEQ to develop an approvable bacteria TMDL for the Upper Hazel River. The final TMDL was completed in April 2007 with subsequent approval by USEPA in January 2008. The TMDL development document can be obtained at the VADEQ office in Woodbridge, VA or via the Internet at www.deq.virginia.gov. Impairment description, water quality monitoring, watershed description, source assessment, water quality modeling, and allocated reductions were reviewed to determine implications of TMDL and modeling procedures on IP development.

4.1 Watershed Description

The Rush River watershed is located in Rappahannock County, Virginia and the Hazel River watershed is located in Madison, Rappahannock, and Culpeper Counties, Virginia (Figure 4.1). The Hughes River watershed area is approximately 45,790 acres consisting mainly of forest (74%) and pasture/cropland (25%). The remaining area is split between residential and water/wetland. The Hazel River watershed is approximately 79,980 acres in size. Hazel River is mainly a forested watershed (about 71%) with pasture/cropland, residential, and water/wetland comprising 28%, 1%, and <1% of the area, respectively. The Rush River watershed area of approximately 9,840 acres is comprised of forest (79%), pasture/cropland (20%), residential (1%), and water/wetland (<1%). The Thornton River watershed area is approximately 90,380 acres consisting mainly of forest (65%) followed by pasture/cropland (33%), residential (1%) and water/wetland (1%) land uses. Figure 4.2 illustrates land uses in the Upper Hazel River watershed.

Hazel River, beginning in Rappahannock County, Virginia slightly south of Panorama, Virginia, runs for approximately 38.7 miles from the headwaters to the confluence with Thornton River and continues flowing for approximately 12.6 miles to the confluence with Rappahannock River, northwest of Remington, Virginia. Hughes River flows for approximately 13.4 miles from the headwaters to the confluence with Hazel River near Slate Mills, Virginia. Rush River flows for approximately 11.0 miles from the headwaters to the confluence with Covington River then Thornton River.

The Hazel River watershed lies in the Blue Ridge and Northern Piedmont Ecoregions. The Blue Ridge Ecoregion varies from narrow ridges to hilly plateaus to more massive mountainous areas. The mostly forested slopes, high-gradient, cool, clear streams, and rugged terrain occur primarily on metamorphic rocks, with minor areas of igneous and sedimentary geology. Appalachian Oak Forests and northern hardwoods coupled with shrub, grass, heath balds, hemlock, cove hardwoods, and oak-pine communities illustrate the floristic diversity of this ecoregion. The Northern Piedmont Ecoregion consists primarily of low rounded hills, irregular plains, and open valleys and is underlain by metamorphic, igneous, and sedimentary rocks. The natural vegetation was mostly Appalachian Oak Forest (dominated by white and red oaks) (Woods et al., 1999). This ecoregion is a transitional area between the mostly mountainous ecoregions of the Appalachians to the west and the lower and more level ecoregions of the coastal plain to the east

(Woods et al., 1999). It is a complex mosaic of Precambrian and Paleozoic metamorphic and igneous rocks, with moderately dissected irregular plains and some hills.

The climate of the Upper Hazel River watershed is characterized based on the meteorological observations from 02/24/1951 to 08/31/2005 assembled by the Southeast Regional Climate Center for the Warrenton S 3E, Virginia (448888) station. Average annual precipitation is 41.25 inches with 54.0% of the precipitation occurring during the crop-growing season (May-October) (SERCC, 2006). Average annual snowfall is 20.3 inches with the highest snowfall occurring during January (SERCC, 2004). Average annual daily temperature is 54.5°F. The highest average daily temperature of 85.9°F occurs in July while the lowest average daily temperature of 22.7°F occurs in January (SERCC, 2006).

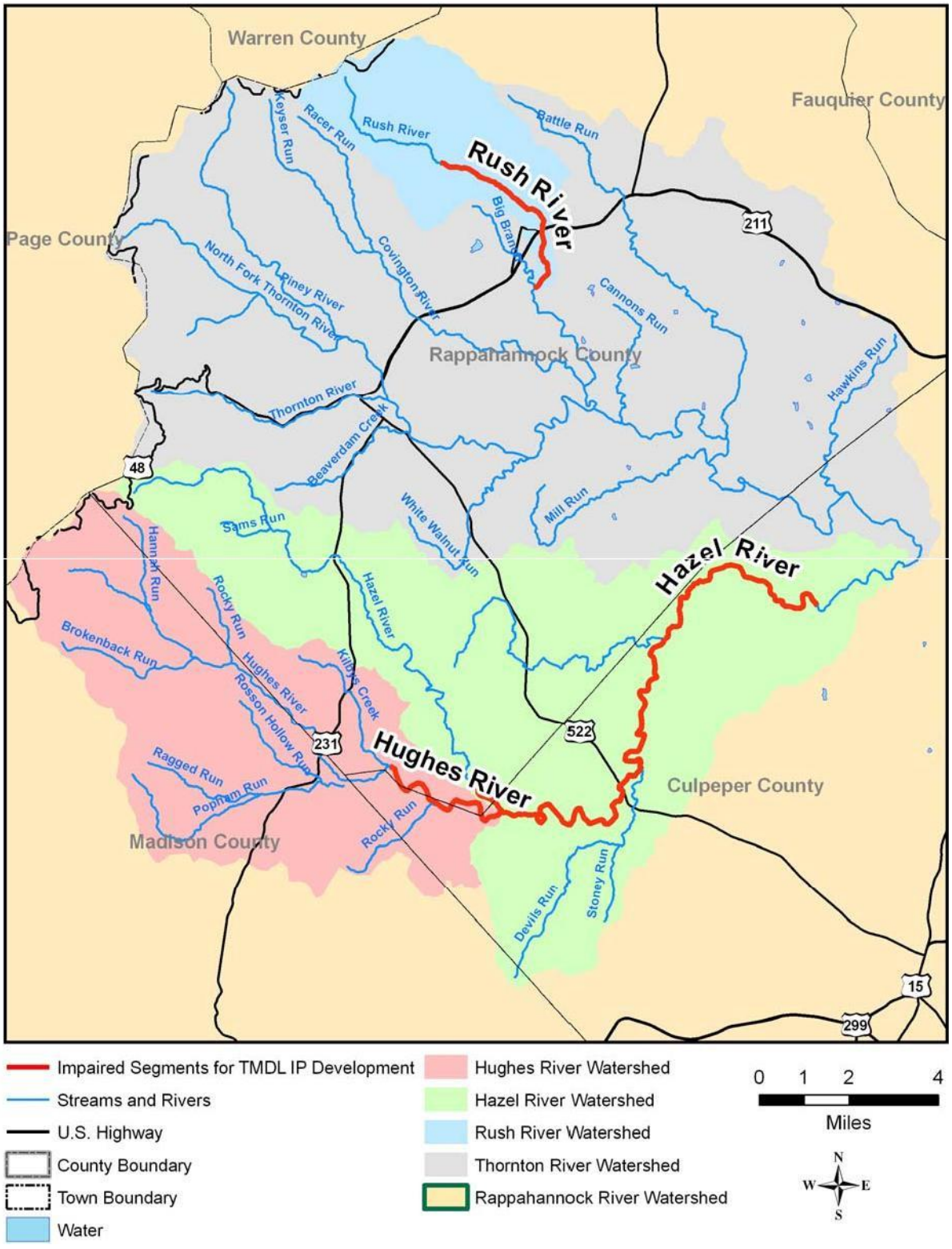

Figure 4.1. Upper Hazel River watershed location.

Map

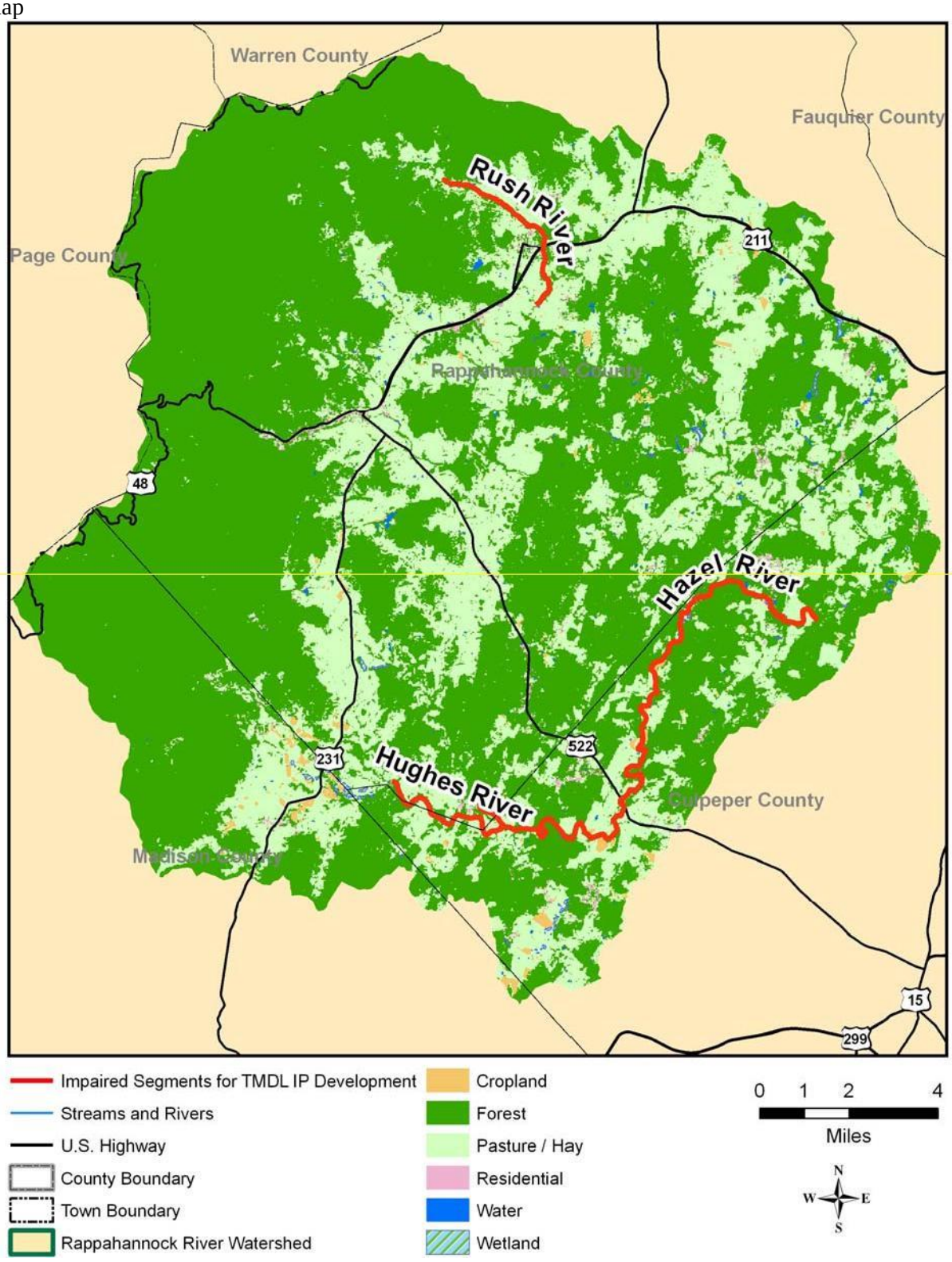

Figure 4.2. Land uses in the Upper Hazel River watershed.

4.2 Water Quality Assessment

Hazel River (VAN-E04R-01) and Rush River (VAN-E05R-01) were initially listed as impaired stream on Virginia's 2002 Section 303(d) Total Maximum Daily Load Priority List and Report (VADEQ, 2003b) and remained on the 2004 Section 303(d) List (VADEQ, 2004) and 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard. Hughes River (VAN-E03R-01) was initially listed as impaired stream on Virginia's 2004 Section 303(d) Total Maximum Daily Load Priority List and Report (VADEQ, 2004) due to water quality exceedances of the bacteria standard. The segment remained on the 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard.

The impaired portion of Hughes River (VAN-E03R-01) delineated by VADEQ, beginning at the confluence with Kilbys Run and continuing downstream approximately 3.68 miles to the confluence with Hazel River, is listed as impaired by fecal coliform and *E. coli* bacteria on Virginia's 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard at station 3-HUE000.20 at Route 644.

The impaired portion of Hazel River (VAN-E04R-01) delineated by VADEQ, beginning at Route 707 bridge and continuing downstream approximately 16.67 miles to the confluence of an Unnamed Tributary to Hazel River at rivermile 16.03, is listed as impaired by fecal coliform and *E. coli* bacteria on Virginia's 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard at station 3-HAZ018.29 at Route 729, station 3-HAZ026.16 at Route 522, and station 3-HAZ032.54 at Route 644. A portion of the impaired section of Hazel River was listed in Attachment C (Plaintiff's list of waters that were added to the 303(d) list in 2002) of the 1999 Consent Decree for fecal coliform.

The impaired portion of Rush River (VAN-E05R-01) delineated by VADEQ, beginning at the confluence of an Unnamed Tributary to Rush River, at river mile 8.78, and continuing downstream approximately 4.55 miles to the confluence of Big Branch, is listed as impaired by fecal coliform and *E. coli* bacteria on Virginia's 2006 Section 303(d) List (VADEQ, 2006) due to water quality exceedances of the bacteria standard at station 3-RUS005.66 at Route 683 bridge, upstream of Route 211/522.

4.3 Bacteria Sources

Potential sources of bacteria considered in TMDL development included both point source and nonpoint source contributions. Permitted point sources are listed in Table 4.1.

Table 4.1. Active VPDES permitted point sources in the Upper Hazel River watershed.

Permit Number	Facility Name	Impairment	Sub-shed	Design Flow (MGD)
VAG406417	Residence	Hughes River	HAR-01	0.001
VA0065358	Boston Water and Sewer STP - Old Facility[1]	Hazel River	HAR-04	0.015
VA0088749	Boston Water and Sewer STP - New Facility[1]	Hazel River	HAR-04	0.450
VA0087581	Washington Town Water Treatment Plant	Rush River	HAR-11	0.006
VA0091651	Rush River Wastewater Treatment Plant	Rush River	HAR-11	0.060
VA0022471	Rappahannock County Elementary School	Thornton River	HAR-13	0.008
VA0064181	Rappahannock County High School	Thornton River	HAR-13	0.005
VA0024449	Panorama Sewage Treatment Plant	Thornton River	HAR-14	0.015
VA0062880	Sperryville Sewage Treatment Plant	Thornton River	HAR-14	0.055

1 Currently, there are two permitted treatment facilities associated with Boston Sewer and Water (VA0065358 and VA0088749). The first, VA0065358 is currently in operation, and has a design flow of 0.0150 MGD. The second, VA0088749, has not been built yet, but has a design flow of 0.4500 MGD. Once the second facility has been built, and begins operation, the first facility will go offline. Thus, it is not practical to assign a load for both facilities, since both facilities will not be operating at the same time. Rather, a load was assigned to the new facility, VA0088749, because that facility has the larger design flow. A load for the new facility will be sufficient to cover the current facility while it is in operation, and provide for the operation of the new facility, once it is built.

Non-point bacteria sources from livestock, human, pets, and wildlife were considered in the four watersheds. It is important to understand the types of sources modeled, their delivery mechanisms, and temporal variations. Table 4.2 gives a summary of non-point source pollution loads. Loads were represented as either land-based loads, where bacteria were deposited on land and available for wash-off during a rainfall event, or as direct loads, where bacteria were directly deposited to the stream. Loads that varied temporally were delivered at a constant rate throughout any given month, but varied on a monthly basis. All loads were spatially distributed based on land use types (e.g. land-based loads from beef cattle were applied to pasture). A portion of the non-point source load from cattle, straight pipes, and a portion of the wildlife load were modeled as a direct load to the stream.

Table 4.2. Sources of bacteria in the impaired watersheds.

Source Category	Source / Animal Type	Applied To	Variation
Human and Pets	Permitted Discharges	Stream	Temporal and Spatial
Human and Pets	Sanitary Sewer	Land	Spatial
Human and Pets	Straight Pipes	Stream	Temporal and Spatial
Human and Pets	Failing Septic Systems	Land	Spatial
Human and Pets	Biosolids Applications	Land	Spatial
Human and Pets	Dogs / Cats	Land	Spatial
Agricultural	Beef Cattle	Land, Stream	Temporal and Spatial
Agricultural	Horses	Land	Temporal and Spatial
Agricultural	Other Livestock	Land	Temporal and Spatial
Wildlife	Deer	Land, Stream	Spatial
Wildlife	Bear	Land, Stream	Spatial
Wildlife	Raccoon	Land, Stream	Spatial
Wildlife	Muskrats	Land, Stream	Spatial
Wildlife	Beavers	Land, Stream	Spatial
Wildlife	Turkeys	Land, Stream	Spatial
Wildlife	Geese	Land, Stream	Spatial
Wildlife	Ducks	Land, Stream	Spatial

4.4 Modeling Procedures

In order to understand the implications of the load allocations determined during TMDL development, it is important to understand the modeling methods used in the analysis. The United States Geological Survey (USGS) Hydrologic Simulation Program - Fortran (HSPF) water quality model was selected as the modeling framework to simulate the bacteria fate and transport for existing conditions and perform TMDL allocations. Seasonal variations in hydrology, climatic conditions, and watershed activities can be explicitly accounted for in the HSPF model. To identify localized sources of bacteria, the watersheds were divided into subwatersheds. These subdivisions were based primarily on homogeneity of land use. The Hazel River model was calibrated using observed flow values from USGS station #01663500 on Hazel River near Rixeyville, VA for the period October 1, 1987 to September 30, 1992. The calibration period covered a wide range of hydrologic conditions, including low- and high-flow conditions, as well as seasonal variations. The calibrated HSPF data set was validated on a separate period from October 1, 1982 to September 30, 1987. Calibration parameters were adjusted within the recommended ranges until the model performance was deemed acceptable.

4.5 Allocation and Staged Implementation Reductions

Several model runs were made investigating scenarios that would meet applicable water quality standards for each impairment. The final TMDL load reductions required in the four impairments are shown in Table 4.3. Load reductions required to meet the staged implementation goal are listed in Table 4.4.

Table 4.3. Required load reductions(%) specified during TMDL development.

Impairment	Straight Pipes	Residential*	Livestock DD	Pasture	Cropland
Hughes River	100	90	90	90	90
Hazel River	100	97	97	97	97
Rush River	100	100	99	99	99
Thornton River	100	94	94	94	94

DD = direct deposition; * Failing septic systems and pets

Table 4.4. Staged implementation required load reductions (%) specified during TMDL development.

Impairment	Straight Pipes	Residential*	Livestock DD	Pasture	Cropland
Hughes River	100	20	75	20	20
Hazel River	100	71	75	71	71
Rush River	100	60	80	60	60
Thornton River	100	59	80	59	59

DD = direct deposition; * Failing septic systems and pets

4.6 Implications of TMDL and Modeling Procedure on Implementation Plan Development

Conditions outlined in the TMDL development study to address bacteria impairments in the Upper Hazel River watershed include:

- Exclusion of most/all livestock including horses from streams is necessary;
- Substantial land-based NPS load reductions are called for on pasture and cropland;
- All straight pipes and failing septic systems need to be identified and corrected;
- Implicit in the requirement to correct straight pipes and failing septic systems is the requirement to maintain all properly functioning septic systems;
- Reductions of pet bacteria loads on residential land use are necessary; and
- Implicit in the requirement for no point source bacteria load adjustment is the requirement for point sources to maintain permit compliance.

5. PUBLIC PARTICIPATION

5.1 Process

Public participation was an integral part of the IP development, and is also critical to promote reasonable assurance that the implementation actions will occur. The actions and commitments compiled in this document are formulated through input from citizens of the watershed; Culpeper, Madison, and Rappahannock County governments; Culpeper Soil and Water Conservation District (CSWCD); Virginia Department of Conservation and Recreation (VADCR); Virginia Department of Environmental Quality (VADEQ); Virginia Department of Health (VDH); Virginia Department of Forestry (VADOF); Virginia Cooperative Extension (VCE); National Park Service (NPS); Rappahannock-Rapidan Regional Commission (RRRC), RappFLOW, Piedmont Environmental Council (PEC), Friends of the Rappahannock (FOR), real estate agents, and Engineering Concepts, Inc. (ECI).

Public participation took place during IP development on three levels. First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project, as well as, a forum for soliciting participation in the smaller, more-targeted meetings (*i.e.*, working groups and Steering Committee). Second, working groups were assembled from communities of people with common concerns regarding the implementation process and were the primary arena for seeking public input. Three working groups were formed: Agricultural, Residential, and Governmental. A representative from VADCR, RRRC, or ECI coordinated each working group in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from the Agricultural, Residential, and Governmental Working Groups; Culpeper, Madison, and Rappahannock County governments; CSWCD; VADCR; VADEQ; VDH; RRRC; NPS; RappFLOW; FOR; and ECI to guide the development of the IP.

The overall goal of the Agricultural, Residential, and Governmental Working Groups was to identify obstacles to implementation in their respective communities and recommend workable solutions that will overcome these obstacles. In addition, the working groups were expected to: identify funding/partnering opportunities that would help to overcome obstacles to implementation, review the IP from an environmental perspective, identify the regulatory authority in the specific areas related to implementation, identify existing programs and resources that might be relevant to the situation, and propose additional programs that would support implementation. The Steering Committee had the expressed purpose of formulating the TMDL IP. In addition, this committee had responsibility for identifying control measures that are founded in practicality, establishing a timeline to insure expeditious implementation, and setting measurable goals and milestones for attaining water quality standards.

All meetings conducted during the course of the IP development are listed in Table 5.1. Over 500 man-hours were devoted to attending these meetings by individuals representing agricultural, residential, commercial, environmental, and government interests on a local, state, and federal level.

Table 5.1. Meetings held during the Upper Hazel River TMDL IP development process.

Date	Meeting Type	Location	Attendance	Time (hr)
09/16/08	Public Meeting	Washington, VA	27	1.5
09/16/08	Agricultural Working Group	Washington, VA	19	1.5
09/16/08	Residential Working Group	Washington, VA	7	1.5
11/18/08	Agricultural Working Group	Washington, VA	21	2.0
11/18/08	Residential Working Group	Washington, VA	9	2.0
01/12/09	Government Working Group	Culpeper, VA	21	2.0
01/12/09	Agricultural Working Group	Culpeper, VA	15	2.0
02/23/09	Steering Committee	Culpeper, VA	14	2.5
03/30/09	Steering Committee	Culpeper, VA	15	2.5
04/23/09	Public Meeting	Washington, VA	30	2.5

5.2 Working Groups Summary

5.2.1 Agricultural Working Group

The Agricultural Working Group (AWG) consisted predominantly of beef producers and horse owners throughout the watershed. Representatives from organizations that serve this community and will have a role in implementation were also included (*e.g.*, CSWCD, NRCS, and VADCR). The AWG is confident that current BMPs eligible for cost-share in TMDL areas and proposed recommendations will provide the necessary incentive for producers and horse owners to implement required BMPs to meet specified reductions to direct stream, pasture, and cropland loads. Challenges, recommendations, and keys for success discussed in the meetings included:

- CREP program or equivalent incentives need to continue to ensure participation in BMP programs.
- Incentive payment for proposed pasture management system needs to reflect energy costs, since fuel would constitute majority of farmer's cost to implement.
- Potential private funding sources and/or partnerships need to be pursued during implementation. (e.g., Chesapeake Bay Funders and Friends of the Rappahannock River).
- Implementation options afforded by non-government funding should be covered with producers.
- Due to amount of exclusion fencing required, implementation timeline should be at least 10 years.
- Livestock exclusion and pasture load reductions should be a priority over cropland load reductions. Cropland acreage listed in TMDL report over-estimates actual area in watersheds and substantial manure collection and land application from confined beef cows is not

prevalent in these areas. An incentive payment is needed to entice farmers to convert cropland to vegetated buffers to help meet specified cropland load reductions.

- Future implementation actions and/or requirements should consider the viability of an individual producer or agricultural as a whole. Overall, Rappahannock County residents appreciate the farming community and rural aspects of the county and do not want it impacted.
- Two new stream exclusion fencing practices offered through the state cost-share program, effective January 15, 2009, address buffer-width, fencing specifications, and increased level of incentives concerns that were discussed by the AWG.
- Individual contact with farmer to define TMDL, explain what it means to the farmer, and outline options for funding sources will be needed. Additional outreach includes field days, small workshops, field visits, and talks at association meetings.

5.2.2 Residential Working Group

The Residential Working Group (RWG), consisting predominantly of watershed residents, agency representatives, VADCR, and RRRC personnel, focused on means to educate and involve public with regard to implementing corrective actions to replace straight pipes, correct failing septic systems, and manage pet waste. Challenges, recommendations, and keys for success discussed in the two meetings included:

- Concerns associated with on-site sewage disposal systems included a lack of state-wide pump-out requirements; unqualified individuals are inspecting and certifying drainfields for home sales; there are no 319 funds available for mandatory hook-ups (Town of Washington); some assistance possible from state revolving loan fund; soils in TMDL-IP area may limit use of traditional septic systems; alternative systems are costly to install and maintain; identification of problem source may be difficult – may include neighbor observation, stream walks to identify straight pipes, conversations with landowners; some owners with failing systems may not accept any cost share assistance.
- Recommendations associated with on-site sewage disposal systems included pump-out should be required at time of property sale and/or require periodic pump-outs; uniformity in pumping/maintenance requirements is needed; develop and implement a system for tracking septic system pump-outs and maintenance; require that information regarding residential septic system management and drain-field location be part of closing documentation at transfer of property; and expand the scope of Rappahannock's Clean Streams Initiative administered by the CSWCD to include the TMDL IP area.
- Several education/outreach techniques need to be utilized during implementation of corrective actions for straight pipes and failing septic systems. The focus must be on obstacles (*e.g.*, money, information, and understanding of issues) that property owners face in correcting problems and proper operation and maintenance of systems. Examples included: school curricula (particularly Earth Science and Health), educational programs presented by CSWCD, newspaper articles, small community meetings, workshops, model septic system and video displayed in public buildings, demonstration at county fair, information packet provided through realtors on proper operation and maintenance of on-site sewage disposal systems, door hangers, and direct mailings.
- Concerns associated with pet waste management included lack of pet waste management ordinances/requirements within the region; no standardization of waste management for

confined canine operations including commercial kennels, hunt clubs, veterinary operations, animal shelters, etc.; and hunt kennels often compost waste and/or spread it on fields.

- Recommendations associated with pet waste management included compiling a database of all confined canine operations, identifying their locations and waste management practices; developing an informational brochure detailing proper pet waste management to be distributed by veterinary offices, local SPCAs, hunt clubs, dog licensing offices, etc.; developing and implementing educational/outreach programs to inform the public of appropriate pet waste management practices; installing pet waste management stations at The Link in Sperryville, the public park in Washington and other identified public dog-walking locations; providing information on, and encourage the use of, private dog waste enzyme digesting composters; determining how existing confined canine operations are currently handling waste and promote those with appropriate management systems while working to improve those with problematic techniques; and developing a model pet/kennel waste management ordinance for consideration and adoption by all localities.
- BMPs listed under the cost-share program (*i.e.*, RB-1 through RB-5), pet waste control program (*i.e.*, signage, pet waste disposal stations, composters, and distribution of educational information), vegetative buffers, and structural BMPs (*e.g.*, retention pond) were recommended control measures.

5.2.3 Governmental Working Group

The Governmental Working Group (GWG) consisting predominantly of agency representatives, VADCR, PEC, RappFLOW, RRRC, and ECI personnel, focused on funding sources, technical assistance needs, regulatory controls, and lead agencies responsible for implementation. Key topics and recommendations included:

- Section 319 funds are not available for mandatory hook-ups as is the case for Town of Washington, some assistance may be available from the State Revolving Loan Fund
- Requirements regarding onsite sewage disposal systems recommended by the RWG are acceptable; however, resources to implement or enforce are a concern.
- The CSWCD Septic System Program currently offered throughout Rappahannock County will receive additional funding next fiscal year and change focus to strictly the Upper Hazel River watershed.
- Although some localities' ordinances support maintaining pets in clean conditions, none appear to require specific pet waste management protocols; and most localities consider hunt club kennels as agricultural with no business licensing requirements.
- GWG considered the CSWCD or RRRC to carry out the responsibilities of the pet waste implementation component of the IP with technical assistance from VADCR, county and town personnel; and VDH. There may also be opportunities for realtors to assist with education material dissemination.
- Based on the recommendations to consider developing programs with greater flexibility in fencing, buffer, and setback requirements; the Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T) and Livestock Exclusion with Reduced Setback for TMDL Implementation (LE-2T) cost-share practices became effective January 15, 2009. The LE-1T practice offers an 85% cost-share and 25% tax credit for traditional requirements of an SL-6 Grazing Land Protection System. The LE-2T practices provide 50% cost-share and 25% tax credit for a 10-feet fence setback requirement from the top of the streambank and the

minimum of two-strand electrified polywire/polytape. The practices have a 10-year life span requirement and have to be inspected ever two years by CSWCD.

- Horse operations, and other non-bovine livestock facilities, should be included in the BMP program.
- Assure that landowners understand that although implementation of BMPs may reduce available grazing acreage, it will not affect their land-use classification.
- Many waterfowl, Canada geese in particular, no longer migrate seasonally, so their impacts to water quality are year-round and cumulative, which has been documented by local water quality testing groups in local ponds. A program needs to be developed and implemented to inform citizens of the benefits of pond bank and streamside buffers. Educational funds made available during implementation phase should be directed at wildlife sources and management options, utilizing VDGIF to develop educational materials.
- Review local ordinances and comprehensive plans to identify opportunities to promote water quality improvement; such as, implementation and/or preservation of riparian buffers.
- Up to $50,000 may be available from the Krebser Foundation in 2009 to close the gap between cost share amounts and full cost needed to implement agricultural BMPs. If available, funding will be limited to Rappahannock County.
- VADCR has $32,709 of Section 319 funds available for CSWCD technical assistance in the Upper Hazel River watershed in 2009. In addition, $162,500 cost-share funding will be available in 2009 through Virginia Water Quality Improvement Fund for targeted agricultural BMP implementation in the Upper Hazel River watershed.
- Funding sources and programs need to be identified for landowner's needs and income levels for the construction or repair of septic systems in rural areas and for landowners in Washington, VA requesting assistance with hook-up fee requirements for the currently proposed wastewater treatment plant.
- The GWG members expressed to VADEQ staff the desire to have at least one continual monitoring station in each of the three impairment watersheds to measure implementation progress.
- Local interest and activities to be integrated with implementation include: RappFlow, Hughes River Partnership, and Rappahannock League for Environmental Protection.

5.3 Steering Committee Summary

The Steering Committee consisted of representatives from the AWG, GWG, RWG, watershed residents, county and town personnel, government agencies, and ECI. The Steering Committee evaluated recommendations from working groups, reviewed BMP quantification and cost estimates, created implementation goals and milestones, reviewed monitoring plan, discussed potential funding resources available, revised implementation plan document, and evaluated materials for final public meeting. The steering committee will periodically revisit implementation progress and suggest plan revisions as needed. Key topics and recommendations included:

- The Thornton River watershed should be included in the Upper Hazel River TMDL IP and residents should be eligible for similar cost-share as residents in Hughes River, Hazel River, and Rush River watersheds;
- Stakeholders need a sense of ownership for the TMDL IP to trigger desire to be involved and implement control measures;

- Overall, Rappahannock County residents appreciate the farming community and rural aspects of the county and do not want it impacted;
- Water quality monitoring needs to continue at station 3-RUS005.66 on Rush River to enable evaluation of control measure implementation; and
- The NPS does not monitor for bacteria, but welcome groups in the park to conduct coliscan monitoring.

5.4 Final Public Meeting Summary

A TMDL IP synopsis was presented to watershed residents, county personnel, government agency representatives, and ECI. In response to questions from attendees, the following information was provided by the panel made up of representatives from Rappahannock County, VADCR, VADEQ, CSWCD, and ECI:

- Part of the TMDL-IP process includes identifying existing regulations;
- The Agricultural Stewardship Act allows neighbors to anonymously file legal complaints against property owners whose agricultural practices are negatively impacting the complainant's property. This act doesn't address bacterial impacts. Complaints filed under this law are no greater in number in TMDL-IP study areas that in other watersheds;
- State law requires the development of an implementation plan, there is no requirement that the plan actually be implemented;
- Updated water quality monitoring information is posted on DEQ's website. The Steering Committee may request some other publicly accessed mechanism for tracking data/report cards;
- Recent legislation (SB1276) requires that the location of alternative on-site sewage treatment systems be shown on deeds of record – no such requirement applies to conventional systems;
- Issues associated with septic systems in flood plains are best addressed by relocating the system, if possible;
- There is no factor included in the model that may be used to identify specific properties as sources of bacterial loading;
- Coliscan monitoring is a quick, inexpensive way to identify levels of concentration of bacteria;
- Wildlife impacts are acknowledged as factors that may prevent reaching water quality improvement goals in this watershed;
- Although water quality may be favorable for macro-invertebrates, it may not be suitable for humans, citizen monitoring of benthics in the Thornton River has consistently scored 12, the highest score in benthic assessments and an indicator of very favorable conditions for these organisms, a low score may reflect contamination due to an excess of nutrients;
- Ordinarily, cost share programs cover 75% of the proposed BMP, cost share funding for BMPs with watersheds with TMDL-IPs is 85%. If demand exceeds fund availability, projects could be prioritized;
- Other than benefits provided through participation in CREP, there is no compensation to farmers for land taken out of production to install BMPs;
- There are new fencing options that reduce the buffer to 10 ft;
- The Krebser fund may be used to partner with cost-share funding in Rappahannock County to a total of $50,000 to assist with the farmer's cost share portion; and
- The importance of preserving and protecting the resource in the headwaters region was recognized.

6. IMPLEMENTATION ACTIONS

6.1 Assessment of Implementation Action Needs

6.1.1Identification of Control Measures

An important element of the implementation plan is to encourage voluntary implementation of control measures for bacteria reductions on the part of local, state, and federal government agencies, agricultural producers, business owners, and private citizens. In order to encourage voluntary implementation, the best information available on types of control measures and program options that achieve the bacteria reduction goals practically and cost-effectively was obtained. Potential control measures were identified through Steering Committee and working group input, literature review, and discussion with the CSWCD, JMSWCD, NRCS, VADCR, VADEQ, VDH, and Rappahannock County government personnel. Control measures were assessed based on cost, availability of existing funds, reasonable assurance of implementation, and water quality impacts (Table 4.1).

The cost of installing potential control measures was determined based on published values and discussion with working groups, Steering Committee, CSWCD, JMSWCD, NRCS, VADCR, VADEQ, VDH, VCE, and local contractors. Control measures that can be promoted through existing programs were identified, as well as control measures that are not currently supported by existing programs and their potential funding sources. Availability of existing programs was determined through discussion with CSWCD, VADCR, VADEQ, VDH, VCE, and Rappahannock County officials participating in the GWG and Steering Committee. The assurance of implementation of specific control measures was assessed through discussion with the AWG, RWG, and GWG.

The allocations determined during the TMDL development dictate, largely, the control measures that must be employed during implementation. In order to meet the stated reductions in direct deposition from livestock, some form of stream exclusion is necessary. Fencing is the most obvious choice, however, the type of fencing, distance from the stream bank, and most appropriate management strategy for the fenced pasture are less obvious. Accounting for this variability at each farm, a full livestock exclusion system was used to estimate the control measure needed to reduce livestock direct deposition.

The proposed Pasture Management System BMP will be utilized to reduce bacteria loads from pasture land-use. If needed, retention ponds will be installed during Stage II of implementation for additional treatment of the stormwater runoff from pasture land. Conversion of cropland field borders to vegetated buffers or forest and manure / biosolids incorporation into the soil will be utilized to reduce bacteria loads from cropland. Manure / biosolids incorporation or injection is a practice in which farmers inject liquid manure below the soil surface or spread manure, then disk the land. The disking mixes manure with soil and has shown to keep manure and nutrients on the land longer. This practice can be done on cropland or pasture/hay land use where manure or biosolids are applied.

Conventional septic system installation, on-site sewage disposal system repair, and alternative sewage disposal system installation will be needed to replace straight pipes and fix failed septic systems. Pet contributions to bacteria runoff from residential land use will be reduced through

implementation of pet waste control program in the watersheds, installation of pet waste enzyme digesting composters, installation of confined canine unit treatment systems, and installation of vegetated buffers.

Implicit in the TMDL is the need to avoid increased delivery of pollutants from sources that have not been identified as needing a reduction, and from sources that may develop over time, as implementation proceeds. One potential for additional bacteria source identified is the resident Canada geese population. Care should be taken to monitor the geese population impact on water quality.

Table 6.1. Estimation of control measures with unit cost (average) and reduction efficiency needed to meet implementation goals during 10-year timeline for agricultural and residential bacteria reductions in Upper Hazel River watershed.

Agricultural Control Measure	Unit	Estimated Units Needed (#)	Unit Cost[1] ($)	Reduction Efficiency (%)
Livestock Exclusion System (e.g., SL-6 system)	System	1,072	21,600	100
Pasture Management System	Acres - Treated	53,621	100	85
Permanent Vegetative Cover on Cropland (SL-1)	Acres - Installed	283	300	75
Reforestation of Erodible Crop and Pastureland (FR-1)	Acres - Installed	283	400	75
Manure / Biosolids Incorporation on Cropland	Acres - Treated	569	20[a]	100
Retention Pond	Acres - Treated	5,419	2,000[a]	30
Technical Assistance	Full Time Equivalent	60[b]	84,000	N/A
Residential Control Measure	**Unit**	**Estimated Units Needed (#)**	**Unit Cost[1] ($)**	**Reduction Efficiency (%)**
Alternative Sewage Disposal System	System	130	25,000	100
New Septic System	System	777	9,000	100
Repaired Septic System	System	439	3,500	100
Pet Waste Enzyme Digesting Composters	System	1,908	50	85
Pet Waste Management Program	System	4	5,000	N/A
Confined Canine Unit Treatment System	System	12	15,000	95
Vegetated Buffers	Acres - Treated	510	400	70
Technical Assistance	Full Time Equivalent	20[b]	84,000	N/A

[1] Unit cost = installation or one-time incentive payment; [a] Cost per acre treated, [b] Total for 10-year timeline

Due to the treatment capacity of a 35-feet buffer along the streambank, it is recommended that all fence, even that which is installed solely at the landowner's expense, be placed at least 35 feet from the stream. An alternative water source was included with the average livestock exclusion system. The CSWCD and NRCS staffs have assisted with the installation of various types of alternative water systems, including; wells, spring developments, pumped stream water, and town water. The main criterion is that the system be dependable. From an environmental perspective, the best management scenario would be to exclude livestock from the stream bank 100% of the time and establish permanent vegetation in the buffer area. This prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from the

pasture, and establishes (with the growth of streamside vegetation) one of the foundations for healthy aquatic life. From a livestock production perspective, the best management scenario is one that provides the greatest profit to the farmer. Obviously, taking land (even a small amount) out of production is contrary to that goal. However, a clean water source has been shown to improve weight gain. Clean water will also improve the health of animals (*e.g.,* cattle and horses) by decreasing the incidence of waterborne illnesses and exposure to swampy areas near streams. Additionally, intensive pasture management, which becomes possible with an alternative water source, has been shown to improve overall farm profitability and environmental impact. From a part-time farmer's perspective, the best management scenario is one that requires minimal input of time. This would seem to preclude intensive pasture management, however, those farmers who have adopted an intensive pasture management system typically report that the additional management of the established system amounts to "opening a gate and getting out of the way" every couple of days. Additionally, the efficient use of the pasture often means that fewer supplemental feedings are necessary. Among both part-time and full-time farmers there are individuals who are hesitant to allow streamside vegetation to grow unrestricted because of aesthetic preferences or because they have spent a lifetime preventing this growth.

6.1.2 Quantification of Agricultural Control Measures

The actions and cost needed in both implementation stages were identified and quantified. The overall numbers represent the Stage II implementation goal of TMDL source allocation attainment, which is required under WQMIRA and by USEPA for eligibility to receive Section 319 grant funds to apply during implementation. An assessment was also conducted to quantify actions and cost that translate to an instantaneous standard violation rate of 10% or less, resulting in removal of Hughes River, Hazel, River, and Rush River from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. This is referred to as the Stage I implementation goal.

The quantity of control measures, or BMPs, recommended during implementation was determined through spatial analyses and modeling alternative implementation scenarios. Spatial analyses of land use, stream-network, and the Commonwealth of Virginia aerial maps along with regionally appropriate data archived in the VADCR Agricultural BMP Database and TMDL document were utilized to establish average estimates of control measures to reduce bacteria loads in the watershed. Additionally, input from local agency representatives, citizens, and contractors were used to verify the analyses. Estimates of control practices needed for full implementation in the four watersheds are listed in Table 6.1

To estimate fencing requirements, the National Hydrography Dataset (NHD) stream network was overlaid with aerial photography. Open areas were identified as having the potential to support livestock. Not every pasture area has livestock on it at any given point in time. However, it is assumed that all pasture areas have the potential for livestock access. Additionally, livestock will occasionally be given access to areas identified as cropland (e.g. following the last cutting of hay for the season). Perennial stream segments that flowed through or adjacent to pasture (open) areas were identified. If the stream segment flowed through the pasture area, it was assumed that fencing was required on both sides of the stream, while if a stream segment flowed adjacent to the pasture area, it was assumed that fencing was required on only one side of the stream. These assumptions were further refined by examining land use criteria, size of resultant pasture, and

existing BMPs. Maps of potential streamside fencing required for streams in Hughes River, Rush River, Hazel River, and Thornton River subwatersheds HAR-01 through HAR-15 are shown in Figures G.1 through G.15 (Appendix G), respectively. Upper Hazel River subwatersheds HAR-01 – HAR-15 are displayed in Figure 6.1.

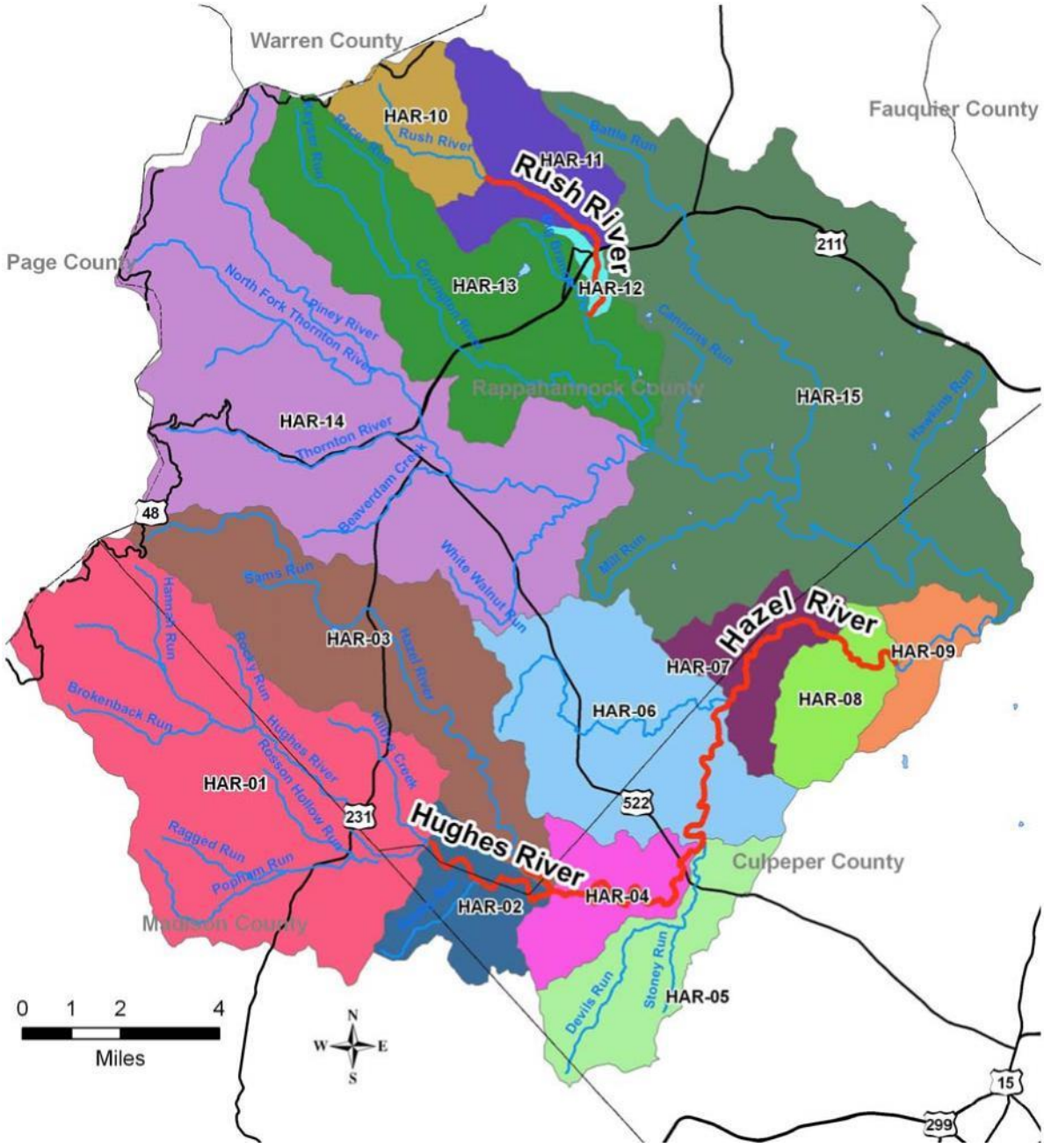

Figure 6.1. Location of subwatershed in the Upper Hazel River watershed.

The VADCR Agricultural BMP Database was utilized to determine typical characteristics (e.g., streamside fencing length per practice) of full livestock exclusion systems leading to the quantification of the number of required systems. The database was queried for information on the SL-6 Grazing Land Protection Systems installed in the Upper Hazel River watershed. The query was limited to SL-6 systems with "linear feet" as the "extent installed". The query results showed 18 SL-6 systems installed between 2002 and 2007 with an average streamside length per system of 2,151 feet. A typical SL-6 system includes streamside fencing for perennial and intermittent streams, cross-fencing for pasture management, hardened crossing, alternative watering system, watering trough, and a 35-ft buffer from the stream. There are approximately 711 miles of perennial streams in the Upper Hazel River watershed. The total length of fencing required on perennial streams in the four watersheds is approximately 462 miles of fence. Potential streamside fencing was divided by the average streamside length per system of 2,151 feet to estimate 1,072 SL-6 systems need to be installed during implementation (Table 6.2).

Table 6.2. Estimation of stream length, streamside fencing, and number of full exclusion systems required in Hughes River, Rush River, Hazel River, and Thornton River watersheds.

TMDL Impairment	Subwatershed	Stream Length(ft)	Streamside Fencing Needed(ft)	Exclusion System Needed(ft)
Hughes River	HAR-01	423,403	335,970	141
Hughes River	HAR-02	98,988	97,397	41
Hazel River	HAR-03	306,164	202,255	91
Hazel River	HAR-04	106,754	84,669	38
Hazel River	HAR-05	125,835	159,809	72
Hazel River	HAR-06	310,449	210,487	95
Hazel River	HAR-07	92,996	34,152	15
Hazel River	HAR-08	92,746	61,871	28
Hazel River	HAR-09	54,925	24,768	11
Rush River	HAR-10	56,760	28,407	13
Rush River	HAR-11	125,518	98,275	45
Rush River	HAR-12	15,919	19,219	9
Thornton River	HAR-13	394,305	227,300	99
Thornton River	HAR-14	632,249	283,119	124
Thornton River	HAR-15	919,113	571,495	250

In order to address the bacteria load reductions on pasture land needed in Hughes River, Rush River, Hazel River, and Thornton River watersheds, the benefit of including a 35-feet buffer with streamside fencing was calculated. A reduction efficiency of 100% was assumed for the buffered area (i.e. fenced out pasture) coupled with 50% efficiency for upland area twice that of the buffered area. Using these efficiencies, the area treated by the buffer was calculated for each watershed. The ratio of the buffered area bacteria load and the applied bacteria load from the TMDL was calculated for pasture livestock access. The average reductions afforded to pasture lands load reduction by the buffers were estimated for Hughes River, Rush River, Hazel River,

and Thornton River, respectively, at 8.6%, 11.8%, 8.4%, and 5.5%. The bacteria load from the remaining pasture land use would be managed using the proposed pasture management BMP. A proposed pasture management system BMP to provide incentive for control of upland pasture loads is recommended with the following anticipated criteria:

- Must have NRCS specified livestock exclusion system installed;
- Must have soil testing performed applying lime and fertilizer based on testing results allowing nutrients to be more readily available resulting in an improved stand.;
- Must maintain a 3-inch minimum grass height through the growing season per NRCS recommended specifications;
- Must mow pastures to control woody vegetation;
- Must chain harrow pasture to break-up manure piles after livestock are removed from field;
- Tax credit provided for chain harrow purchase; and
- Incentive payment of $100/ac provided.

The reduction efficiency of the proposed pasture management system BMP was estimated at 85%. Total of 53,621 acres in the Upper Hazel River watershed will be included in the pasture management system BMP. Given reductions were not sufficient to meet TMDL reduction goals, installation of retention ponds may be necessary to treat runoff from this acreage during Stage II of implementation (Table 7.1).

During IP development, the AWG and GWG noted a decreasing trend in cropland acres and minimal land application of collected beef manure in the Upper Hazel River watershed. The conversion of cropland to pasture or forest land uses results in a bacteria load reduction. Therefore, it was decided that the primary control measure for cropland bacteria load reduction will be permanent conversion of cropland to pasture and forest land uses. The conversion was divided evenly between SL-1 Permanent Vegetative Cover and FR-1 Reforestation of Erodible Crop and Pastureland BMPs. Additionally, manure / biosolids incorporation into soil was need in part of the watershed. Converting 283 acres to pasture and 283 acres to forest land uses and incorporating manure / biosolids into soil on approximately 569 cropland acres during Stage II was estimated to address required cropland reductions (Table 6.1 and 7.1).

6.1.3 Quantification of Residential Control Measures

The number of straight pipes and failing septic systems were based on numbers reported in the TMDL documents. It was decided that budgeting should be based on correcting all systems identified. Based on discussion with Rappahannock County Health Department and Steering Committee, it was assumed that 90% of the straight pipes would be replaced with a conventional septic system and 10% replaced with an alternative on-site sewage disposal system. Failing septic systems were assumed to be corrected by repairing the existing septic system (40%), installing a new conventional septic system (50%), or installing a new alternative sewage disposal system (10%). It is estimated that 439 septic system repairs, 777 conventional septic systems, and 130 alternative on-site sewage disposal systems are considered necessary to correct straight pipes and failing septic systems in the four watersheds during Stage I (Table 7.1).

A four-step program was proposed to address pet waste reductions. In the first step, a pet waste control program consisting of educational packets, signage, and disposal stations in public areas will be instituted in each watershed. The second step will be installing pet waste enzyme

digesting composters at 1,908 residences. The third step will be identification of confined canine units (CCU) and installing approximately 12 CCU waste treatment systems throughout the Upper Hazel River watershed. The installation of vegetated buffers on residential land use is the fourth step. Components of the four-step program are outlined in Table 7.1.

6.2 Assessment of Technical Assistance Needs

Members of the AWG, RWG, and GWG agree that technical assistance and education are keys to getting people involved in implementation. There must be a proactive approach to contact farmers and residents to articulate exactly what the TMDL means to them and what will most practically get the job done. Several education/outreach techniques will be utilized during implementation. Articles describing the TMDL process, the reasons why high levels of fecal bacteria are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the problem, and the potential ramifications of not dealing with the problem should be made available to the public through as many channels as possible (*e.g.*, newsletters, packet to new homeowners, and targeted mailings). Workshops and demonstrations should be organized to show landowners the extent of the problem, the effectiveness of control measures, and the process involved in obtaining technical and financial assistance.

For the agricultural community, field days, pasture walks, and demonstrations offered through local farm groups were recommended. The emphasis was on having local farmers discuss their experiences with the cost-share programs, demonstrating the advantages of clean water source and pasture management, and presenting monitoring results to demonstrate the problem. It is generally accepted that farmers will be more persuaded by discussion with local technical personnel or fellow farmers who have implemented the suggested control measures than through presentations made by state-agency representatives. Articles describing the TMDL process, the reasons why high levels of bacteria are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the problem, and the potential ramifications of not dealing with the problem should be made available to the public through as many channels as possible (e.g. Farm Bureau newsletters, FSA newsletters, and targeted mailings). Notices using all media outlets (e.g., cable television, public access channel programming, and links on county website) need to be posted regarding status of implementation. Posting of informative/recognition signage throughout watershed (e.g., conservation practices implemented on farm) may prompt neighbors to participate. In general, a proactive approach to education needs to take place, whereby, technicians need to contact each landowner instead of waiting for the landowner to make contact.

For residential issues, public outreach should focus on means to educate and involve public with regard to implementing corrective actions to replace straight pipes, correct failing septic systems, and manage pet waste. Several education/outreach techniques need to be utilized during implementation of corrective actions for straight pipes and failing septic systems. The focus must be on obstacles (*e.g.*, money, information, and understanding of issues) that property owners face in correcting problems and proper operation and maintenance of systems Examples included: newspaper articles, small community meetings, workshops, model septic system and video displayed in public buildings, demonstration at county fair, information packet provided through realtors on proper operation and maintenance of on-site sewage disposal systems, and mailings.

Technical assistance and educational outreach tasks were identified during plan development that would be needed during implementation. The following tasks associated with agricultural and residential programs were identified:

Agricultural Programs

1. Make contacts with landowners in the watershed to make them aware of implementation goals and cost-share assistance programs.
2. Provide technical assistance for agricultural programs (e.g. survey, design, layout, and approval of installation).
3. Develop educational materials & programs.
4. Organize educational programs (*e.g.*, pasture walks, presentations at field days or club events...).
5. Distribute educational materials (*e.g.*, informational articles in FSA or Farm Bureau newsletters, local media).
6. Handle and track cost-share.
7. Assess and track progress toward BMP implementation goals.
8. Follow-up contact with landowners who have installed BMPs.
9. Coordinate use of existing agricultural programs and suggest modifications where necessary.

Residential Programs

1. Identify failing septic systems & straight-pipes (*e.g.*, stream walks, analysis of aerial photos, mailings, monitoring, and home visit).
2. Identify confined canine units (*e.g.*, mailings, County databases, site visit).
3. Track on-site sewage disposal system repairs/ replacements/ installations for human and confined canine units.
4. Handle and track cost-share.
5. Develop educational materials & programs.
6. Organize educational programs and demonstration projects.
7. Distribute educational materials (*e.g.*, informational pamphlets on TMDL & on-site sewage disposal systems).
8. Assess progress toward implementation goals.
9. Follow-up contact with landowners who have participated in the program(s).

To determine the number of full time equivalents (FTE) considered necessary for agricultural technical assistance during implementation, the average cost-share amount of practices needed to be installed per year during implementation was divided by an average cost-share amount (i.e., $370,000) that one FTE can process in a year. It was assumed that all BMPs would need some level of technical assistance and the FTE would be responsible for educational outreach. Six FTEs per year, five for livestock exclusion systems and one for pasture and cropland load

reductions, providing technical assistance for the agricultural program are needed throughout the ten-year implementation timeline (*i.e.*, 60 total). Members of the RWG, GWG, and Steering Committee estimated that two technical FTE per year, one for on-site sewage disposal system corrections and one for pet waste management, would be required throughout the ten-year implementation timeline (*i.e.*, 20 total) to provide technical assistance and educational outreach tasks to reduce bacteria loads on residential land uses.

6.3 Cost Analysis

Associated cost estimations for each implementation action during Stages I and II were calculated by multiplying the average unit cost per the number of units shown in Table 6.1. Table 6.3 lists installation and technical assistance costs to implement agricultural and residential programs for implementation Stages I and II. Focusing on Stage I (*i.e.*, removal of impairments from impaired waters list) costs, the average installation cost for full livestock exclusion systems and pasture management system BMPs in the Upper Hazel River watershed is $13.87 million and $3.32 million, respectively. There is no cost in Stage I associated with control measures to obtain the cropland land-applied reductions in the Upper Hazel River as these reductions will be a focus in Stage II. Estimated corrective action costs needed to replace straight pipes and fix failing septic systems during Stage I totals $7.10 million excluding technical assistance. The cost to implement the four-step pet waste reduction process totals an estimated $0.26 million excluding technical assistance.

It was determined by the JMSWCD, VADCR, VDH, GWG, and steering committee members that it would require $60,000 and $48,000 to support the salary, benefits, travel, and training of one technical FTE and administrative FTE, respectively. The total cost to provide assistance in the agricultural and residential programs during Stage I implementation is expected to be $3.02 million and $1.01 million, respectively. The total Stage I implementation cost including technical assistance is $28.58 million with the agricultural cost being $20.21 million and the residential cost $8.37 million (Table 6.3).

Table 6.3. Implementation cost associated with percentage of practices installed addressing agricultural and residential practices along with technical assistance needed in Upper Hazel River watershed.

YEAR	Livestock Direct Deposition ($)	Pasture Load Reduction ($)	Cropland Load Reduction ($)	Agricultural Technical Assistance ($)	Agricultural Total ($)	Onsite Sewage Disposal Systems ($)	Pet Waste Management ($)	Residential Technical Assistance ($)	Residential Total ($)	TOTAL COST ($)
1	2,311,000	536,000	0	504,000	**3,351,000**	1,184,000	30,000	168,000	**1,382,000**	**4,733,000**
2	2,311,000	536,000	0	504,000	**3,351,000**	1,184,000	30,000	168,000	**1,382,000**	**4,733,000**
3	2,311,000	536,000	0	504,000	**3,351,000**	1,184,000	45,000	168,000	**1,397,000**	**4,748,000**
4	2,311,000	536,000	0	504,000	**3,351,000**	1,184,000	45,000	168,000	**1,397,000**	**4,748,000**
5	2,311,000	590,000	0	504,000	**3,405,000**	1,184,000	55,000	168,000	**1,407,000**	**4,812,000**
6	2,311,000	590,000	0	504,000	**3,405,000**	1,184,000	55,000	168,000	**1,407,000**	**4,812,000**
7	2,311,000	3,246,000	49,000	504,000	**6,110,000**	1,184,000	61,000	168,000	**1,413,000**	**7,523,000**
8	2,311,000	3,246,000	49,000	504,000	**6,110,000**	1,184,000	61,000	168,000	**1,413,000**	**7,523,000**
9	2,333,000	3,193,000	49,000	504,000	**6,079,000**	1,184,000	61,000	168,000	**1,413,000**	**7,492,000**
10	2,333,000	3,191,000	49,000	504,000	**6,077,000**	1,184,000	61,000	168,000	**1,413,000**	**7,490,000**
Stage I Total (1-6)	**13,866,000**	**3,324,000**	**0**	**3,024,000**	**20,214,000**	**7,104,000**	**260,000**	**1,008,000**	**8,372,000**	**28,586,000**
Stage II Total (7-10)	**9,288,000**	**12,876,000**	**196,000**	**2,016,000**	**24,376,000**	**4,736,000**	**244,000**	**672,000**	**5,652,000**	**30,028,000**
Total (1-10)	**23,154,000**	**16,200,000**	**196,000**	**5,040,000**	**44,590,000**	**11,840,000**	**504,000**	**1,680,000**	**14,024,000**	**58,614,000**

6.4 Benefit Analysis

The primary benefit of implementation is cleaner waters in Virginia, where bacteria levels in Upper Hazel River will be reduced to meet water quality standards. Cleaner waters can benefit human health, stakeholder economy, livestock herd health, and aquatic community.

6.4.1 Human Health

It is hard to gauge the impact that reducing fecal contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, the incidence of infection from fecal sources, through contact with surface waters, should be reduced considerably. The residential programs will play an important role in improving water quality, since human waste can carry with it human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry.

6.4.2 Economics

An important objective of the IP is to foster continued economic vitality and strength. Healthy waters can improve economic opportunities for Virginians, and a healthy economic base can provide the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the landowner, along with the expected environmental benefits on-site and downstream. For example, exclusion of cattle from streams leading to the development of alternative (clean) water sources, improved pasture management, private sewage system maintenance, and improved aesthetics around businesses provide economic benefits. Additionally, money spent by landowners, government agencies, and non-profit organizations in the process of implementing the IP will stimulate the local economy.

The benefit of a Grazing Land Protection System BMP is improved profit through more efficient utilization and harvest of forage by grazing animals. Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal (VCE, 1996). Several factors contribute to greater profitability: stocking rate can usually be increased by 30% to 50%; high-quality, fresh, and unsoiled vegetative growth available throughout the grazing system increases weight gain per acre; vigor of the pasture sod is improved; and handling and checking grazing animals is easier. More accurate estimates of the amount of forage available, greater uniformity in grazing of pastures, flexibility of harvesting and storing forage not needed for grazing, and extending the length of the grazing season while providing a more uniform quality and quantity of forage throughout the season are important benefits afforded by this system (VCE, 1996).

In terms of economic benefits to homeowners, an improved understanding of private sewage systems, including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. In addition, investment in the home is protected with a properly functioning sewage disposal system. A home's value can be decreased up to 40% with a failed septic system (Shepherd, 2006). The average septic system will last 20-25 years if properly maintained. Proper maintenance includes: knowing the location

of the system components and protecting them by not driving or parking on top of them, not planting trees where roots could damage the system, keeping hazardous chemicals out of the system, and pumping out the septic tank every three to five years. The cost of proper maintenance, as outlined here, is relatively inexpensive in comparison to repairing or replacing an entire system.

Improved aesthetics in public areas (*e.g.*, parks) and surrounding businesses provided by control measures (*e.g.*, pet waste kiosks and bioretention) has the potential to draw local citizens and visitors to these areas. In addition, a healthy waterway has the potential to attract local citizens and visitors for recreation uses such as fishing, kayaking, and canoeing.

6.4.3 Livestock Herd Health

A clean water source coupled with exclusionary fencing has been shown to improve weight gain; decrease stress; reduce herd health risks associated with increased exposure to water-transmitted diseases, bacteria, virus and cysts infections; reduce mastitis and foot rot; and decrease herd injuries associated with cattle climbing unstable streambanks or being stuck in mud.

6.4.4 Aquatic Community Improved

Stream bank protection provided through exclusion of livestock from streams will improve the aquatic habitat in these streams. Vegetated buffers that are established will also help reduce sediment and nutrient transport to the stream from upslope locations. The installation of improved pasture management systems should also reduce soil and nutrient losses and increase infiltration of precipitation; thereby, decreasing peak flows downstream. Reductions in nutrient and sediment loadings contribute to attainment of nutrient and sediment reduction goals for the Commonwealth of Virginia Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the Rappahannock River and Northern Neck Coastal Basins, April 2004. Local initiatives, such as Rappahannock County Riparian Easement Program, will additionally be complemented by actions performed during TMDL implementation.

7. MEASUREABLE GOALS AND MILESTONES FOR ATTAINING WATER QUALITY STANDARDS

The end goals of implementation are:

1) Restored water quality in the impaired waters, and
2) Subsequent de-listing of streams from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters.

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the percentage of control measures installed within certain timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. Progress toward end goals will be assessed during implementation through tracking of control measure installations by Culpeper Soil and Water Conservation District; Natural Resources Conservation Service; Virginia Department of Health, Virginia Department of Conservation and Recreation; Culpeper, Madison, and Rappahannock Counties; Town of Washington; and RRRC. The VADEQ will continue to assess water quality through its monitoring program. Other monitoring project activities in the watersheds (*e.g.*, RappFLOW) will be coordinated with VADEQ to augment the VADEQ monitoring program. Implementation will be assessed based on reducing exceedances of the bacteria water quality standard to improve water quality resulting in removal of Hughes River, Hazel River, and Rush River from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters.

Implementation of control measures is scheduled for 10 years and will be assessed in two stages. Stage I is based on meeting source allocations that translate to an instantaneous standard violation rate of 10% or less resulting in removal of Hughes River, Hazel River, and Rush River from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. The Stage II goal is based on implementing source allocations to meet the specified TMDL goal, 0% exceedance of water quality standards. Implementation of control measures is scheduled to begin in July 2009 lasting to June 2019 (Table 7.1). After implementation inception, three milestones will be met in Stage I and two milestones in Stage II.

Implementation in years one through six for agricultural source reductions focuses on livestock exclusion and pasture management systems. BMPs installed in years seven through ten are based on additional livestock exclusion, additional treatment of runoff from pasture land using retention ponds to remove remaining bacteria load not treated with the pasture management systems installed during Stage I, cropland conversion, and manure / biosolids incorporation into soil. Retention ponds are more costly and are logistically more difficult to design and locate on individual farms. Implementation in years one through six for residential bacteria loads focuses on identification and removal of straight pipes, repairing or replacing failed septic systems, installation of pet waste enzyme digesting composters, instituting pet waste control programs, and installation of storage and treatment systems for waste from confined canine units (CCU). Implementation of these control measures will continue in years seven through ten if needed.

Table 7.1 lists the cumulative progress towards the TMDL endpoint as implementation milestones are met. Water quality improvement is expected to increase each year. An 18% overall bacteria load reduction is expected at the second year, 37% in the fourth year, and 57% in the sixth year. Based on water quality modeling projections for the sixth year (Milestone 3), the Hughes River, Hazel River, and Rush River would be in a probable position to be de-listed from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. Considering the dynamics of a stream ecosystem and the inherent difficulties that may arise preventing BMP implementation, the final milestone of TMDL allocation attainment was set at 10 years following implementation commencement.

The process of a staged implementation implies targeting of control measures, ensuring optimum utilization of resources. In quantifying agricultural BMPs through the use of aerial, land use, and stream network GIS layers, maps were formulated showing potential livestock access, pastureland, and crop fields. Maps depicting potential streamside fencing required in each subwatershed are located in Appendix G. These maps identify farm tracts that CSWCD should concentrate efforts in. Owners will be contacted and progression through BMP installation will be tracked. Known problem areas, clusters of older homes, or houses in close proximity to streams known by the VDH will be targeted for onsite treatment system control measures. Steps outlined in pet waste BMP stages results in targeting of source type and resources.

Table 7.1. Cumulative implementation and water quality milestones along with cost for Upper Hazel River watershed.

***Agricultural* Control Measure**	**Unit**	**Milestone 1* Completed by 2011**	**Milestone 2* Completed by 2013**	**Milestone 3* Completed by 2015**	**Milestone 4** Completed by 2017**	**Milestone 5** Completed by 2019**
Livestock Exclusion System (e.g., SL-6 system)	System	214	428	642	856	1,072
Pasture Management System	Acres - Treated	10,724	21,448	32,172	42,896	53,621
Permanent Vegetative Cover on Cropland (SL-1)	Acres - Installed	0	0	0	142	283
Reforestation of Erodible Crop and Pastureland (FR-1)	Acres - Installed	0	0	0	142	283
Manure / Biosolids Incorporation on Cropland	Acres - Treated	0	0	0	284	569
Retention Pond	Acres - Treated	0	0	0	2,710	5,419
Technical Assistance	Full Time Equivalent	12	24	36	48	60
***Residential* Control Measure**	**Unit**	**Milestone 1* Completed by 2011**	**Milestone 2* Completed by 2013**	**Milestone 3* Completed by 2015**	**Milestone 4** Completed by 2017**	**Milestone 5** Completed by 2019**
Alternative Sewage Disposal System	System	26	52	78	104	130
New Septic System	System	156	312	468	624	777
Repaired Septic System	System	88	176	264	352	439
Pet waste Management Program	System	2	4	4	4	4
Pet Waste Enzyme Digesting Composters	System	382	764	1,146	1,528	1,908
Confined Canine Unit Treatment System	System	2	6	12	12	12
Vegetated Buffers	Acres - Treated	0	0	0	256	510
Technical Assistance	Full Time Equivalent	4	8	12	16	20
Cumulative Bacteria Reduction	**(%)**	**18.3**	**36.7**	**56.7**	**76.6**	**94.9**
Cumulative Cost	**(millions $)**	**9.47**	**18.96**	**28.59**	**43.63**	**58.61**

*Stage I

**Stage II

7.1 Monitoring

Virginia's 1997 WQMIRA requires that TMDL IPs include measurable goals and milestones for attaining water quality standards. Implicit in those milestones is the requirement of a method to measure progress. Implementation progress will be evaluated through water quality monitoring conducted by VADEQ through the agency's monitoring program and any additional monitoring support (*i.e.*, citizen monitoring) that may develop as implementation progresses. RappFLOW (www.RappFLOW.org), a citizen interest group, regularly monitors streams in Rappahannock County and has recently completed an extensive water quality study of the county.

VADEQ will monitor at eight stations located in the Upper Hazel River watershed (Table 7.2 and Figure 7.1). Stations 3-HUE000.20, 3-HAZ018.29, 3-THO006.50, and 3-THO014.37 are ambient trend stations and will be monitored indefinitely on a bi-monthly basis during implementation. Stations 3-THR000.50, 3-POH000.48, and 3-XHH000.24 are watershed stations and will be monitored on a bi-monthly basis from January 2009 through December 2010, after which monitoring continuation by VADEQ beyond this period will be evaluated. The GWG and Steering Committee requested that monitoring continue at station 3-RUS005.66, the station used to designate Rush River as impaired. A two-year sampling rotation from 2007-2008 was recently completed at station 3-RUS005.66 and VADEQ plans to continue monitoring at least through 2010 to aid in assessing implementation progress. The following parameters will be collected at the ambient trend monitoring stations: *E. coli* bacteria, temperature, dissolved oxygen, pH, specific conductance, total nitrogen, total phosphorus, total solids, and total suspended solids. For the watershed stations, the same parameters are collected at trend stations excluding total suspended solids. Monitoring results are accessible on the VADEQ website (http://www.deq.state.va.us/water/).

Table 7.2. Monitoring station identification, station location, station type, and monitoring schedule for VADEQ monitoring stations in the Upper Hazel River watershed.

Station ID	Station Location	Station Type	Monitoring Schedule
3-HUE000.20	Hughes River at Route 644	Trend[1]	long term
3-HAZ018.29	Hazel River at Route 729	Trend	long term
3-RUS005.66	Rush River at Route 683	TMDL IP[2]	2009 - 2010
3-THO006.50	Thornton River at Route 729	Trend	long term
3-THO014.37	Thornton River at Route 626	Trend	long term
3-THR000.50	North Fork Thornton River at Route 211 / 522	Watershed[3]	2009 – 2010
3-POH000.48	Popham Run at Route 603	Watershed	2009 – 2010
3-XHH000.24	Unnamed Tributary to Thornton River at Route 626	Watershed	2009 – 2010

[1] Trend Stations – historically located, long-term water quality monitoring stations used to assess changes in water quality over long periods of time; sampled at least six times per year

[2] TMDL IP Stations – located in watersheds with a developed TMDL IP; designed to track implementation progress; sampled six times during the year (sampling occurs every other month)

[3] Watershed Stations – typically located near mouth of a watershed; designed to provide comprehensive statewide coverage of smaller watersheds; sampled 12 times over a consecutive two-year period (sampling occurs every other month); each watershed is monitored for a two-year term within a six-year rotational cycle

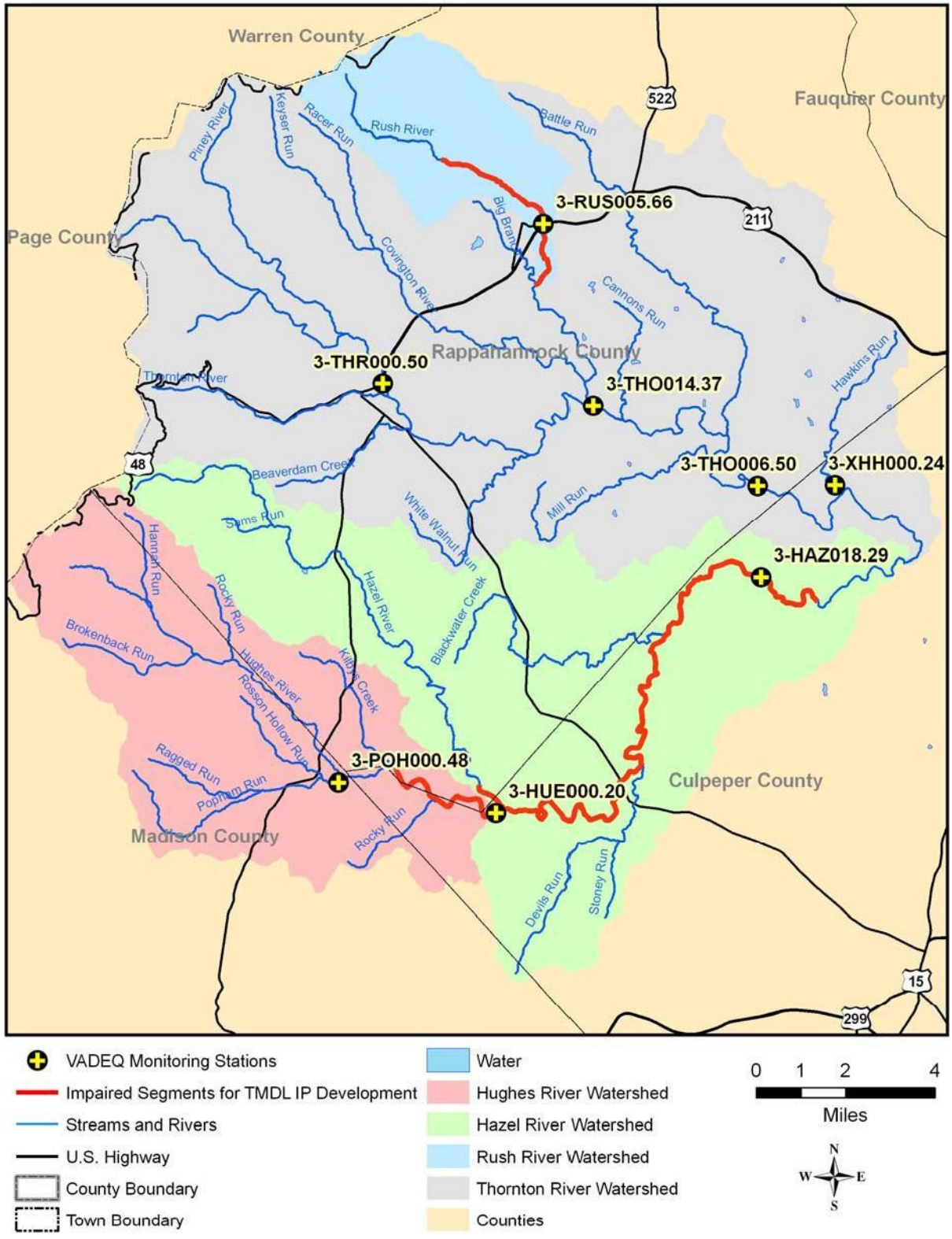

Figure 7.1. Location of VADEQ monitoring stations in the Upper Hazel River watershed.

8. STAKEHOLDER'S ROLES AND RESPONSIBILITIES

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals, and special interest groups. Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role falls on the local groups that are most affected; that is, businesses, community watershed groups, and citizens. However, local, state, and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. Stakeholder participation and support is essential for achieving the goals of this TMDL effort (*i.e.*, improving water quality and removing streams from the impaired waters list). Agricultural, residential, and governmental action items during implementation are included in Table 8.1 – 8.3, respectively. Virginia's approach to correcting non-point source pollution problems continues to be encouragement of participation through education and financial incentives; that is, outside of the regulatory framework. If, however, voluntary approaches prove to be ineffective, it is likely that implementation will become less voluntary and more regulatory.

Table 8.1. Agricultural implementation action items (courtesy of VADCR).

Source Issues	Corrective Actions	Potential Funding Source	Who will assist?
Cattle in stream	Livestock Exclusion Best Management Practices	Agri. Cost Share, Water Quality Improvement Fund (WQIF), 319 Funds, Krebser Fund, Friends of Rappahannock, NRCS	Culpeper SWCD, Natural Resource Conservation Service (NRCS)
Pasture runoff	Pasture Management Best Management Practices	Agri. Cost Share, NRCS	Culpeper SWCD, NRCS
Poor stream buffers	Improved buffers (grass and trees)	Conservation Reserve Enhancement Program, Dept. Game and Inland Fisheries, Dept. of Forestry, Agri. Cost Share	Dept. Game and Inland Fisheries, Dept. of Forestry, Culpeper SWCD, NRCS
Lack of Best Management Practice knowledge	Agri. Best Management Practice Education, Outreach events	WQIF, Va. Cooperative Extension, NRCS	Culpeper SWCD, Va. Cooperative Extension
Cattle access to water	Alternate water source	Agri. Best Management Practice, DEQ (low interest loan), NRCS	Culpeper SWCD, Va. Dept. of Environmental Quality (DEQ), NRCS
Targeting locations for fencing	Ground truthing, stream walks		Culpeper SWCD, RappFLOW, other community interest groups

Table 8.2. Residential implementation action items (courtesy of VADCR).

Source Issues	Corrective Actions	Potential Funding Source	Who will assist?
Lack of septic system maintenance	Regular septic system maintenance	Water Quality Improvement Fund (WQIF), National Fish & Wildlife Foundation (NFWF), Homeowners	Culpeper SWCD, Virginia Department of Health (VDH)
Septic system failure and/or of straight pipes	Septic system installation and maintenance	WQIF, National Fish & Wildlife Foundation, Homeowners	Culpeper SWCD, VDH
Lack of septic system pump out tracking	Computerized tracking system	VDH	VDH, Local Governments
Need for septic system location at time of home sale	Local Ordinance	Homeowners	Local Governments
Need for septic system education across entire watershed	Septic system education program	WQIF, National Fish & Wildlife Foundation, Chesapeake Bay Funders	Realtors, teachers, Culpeper SWCD, community interest groups
No pet waste management	Education program, bag stations, composters, structural practices in concentrated canine areas (kennels)	Va. Cooperative Extension, Culpeper SWCD, WQIF, NFWF, Roundtables	Community interest groups, Local governments, hunt clubs, Veterinarians, SPCA
Riparian buffers needed for non-agricultural land	Install grass/tree buffers along streams	Piedmont Environmental Council, Va. Dept. of Forestry. NFWF, private foundations	RappFLOW, Rappahannock Rapidan Regional Commission (RRRC), PEC
Current pond management encourages geese	Educate landowners on leaving buffer around ponds to deter geese	private landowners, Homeowner Associations, NFWF, DGIF	Rapp FLOW, landowners
Runoff from streamside properties	Lanscaping to reduce runoff, low impact development techniques	Homeowners, Developers, NFWF	RappFLOW, Local Governments, other community interest groups
Need for horse owner education of Best Management Practices	Education program for pasture management, alternative watering sources, livestock exclusion	Agri. Best Management Practice cost share, Va. Cooperative Extension, WQIF	Culpeper SWCD, Va. Cooperative Extension, community interest groups

Table 8.3. Governmental implementation action items (courtesy of VADCR).

Source Issues	Actions & Support	Potential Funding Source	Who will assist?
Continual baseline water quality monitoring	Water quality monitoring: ambient/benthic	Department of Environmental Quality (DEQ)	DEQ
Supplemental ambient/benthic monitoring	Water Quality monitoring: ambient/benthic; coliscan (bacteria monitoring)	DEQ, NFWF, Va. Naturally, National Park Service (NPS)	RappFLOW, Culpeper SWCD, NPS (& friends groups)
Local Government Incentives	Ordinance/code options to improve water quality (stream buffer overlay district)	Local Government	Local Government, Rapp. Rapidan Regional Comm., Friends of the Rappahannock
Inadequate tracking of alternative septic systems	Develop tracking system/ensure maintenance agreement on file	Local Government	Local Government

The roles and responsibilities of some of the major stakeholders on a federal, state, and local level are as follows:

USEPA: The United States Environmental Protection Agency has the responsibility of overseeing the various programs necessary for the success of the CWA. However, administration and enforcement of such programs falls largely to the states.

NRCS: The Natural Resources Conservation Service is the federal agency that works hand-in-hand with the American people to conserve natural resources on private lands. NRCS assists private landowners with conserving their soil, water, and other natural resources. Local, state and federal agencies and policymakers also rely on the expertise of NRCS staff. NRCS is also a major funding stakeholder for impaired water bodies through the Conservation Reserve Enhancement Program (CREP) and the Environmental Quality Incentive Program (EQIP).

In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments in conjunction with the state can develop ordinances involving pollution prevention measures. In addition, citizens have the right to bring litigation against persons or groups of people who can be shown to be causing some harm to the claimant. Through hearing the claims of citizens in civil court, and the claims of government representatives in criminal court, the judicial branch of government also plays a significant role in the regulation of activities that impact water quality.

Currently, there are seven state agencies responsible for regulating and/or overseeing statewide activities that impact water quality in Virginia. These agencies include: VADEQ, VADCR, Virginia Department of Agriculture and Consumer Services (VDACS), VDGIF, Virginia Department of Health (VDH), Virginia Department of Forestry (VADOF), and VCE.

VADEQ: The State Water Control Law authorizes the SWCB to control and plan for the reduction of pollutants impacting the chemical and biological quality of the State's waters resulting in the degradation of the recreation, fishing, shellfishing, aquatic life, and drinking water uses. For many years the focus of VADEQ's pollution reduction efforts was the treated effluent discharged into Virginia's waters via the VPDES permit process. The TMDL process has expanded the focus of VADEQ's pollution reduction efforts from the effluent of wastewater treatment plants to the pollutants causing impairments of the streams, lakes, and estuaries. The reduction tools are being expanded beyond the permit process to include a variety of voluntary strategies and BMPs. VADEQ is the lead agency in the TMDL process. The Code of Virginia directs VADEQ to develop a list of impaired waters, develop TMDLs for these waters, and develop IPs for the TMDLs. VADEQ administers the TMDL process, including the public participation component, and formally submits the TMDLs to USEPA and the SWCB for approval. VADEQ is also responsible for implementing point source WLAs, regulation of biosolids applications, assessing water quality across the state, and conducting water quality standard related actions.

VADCR: The Virginia Department of Conservation and Recreation is authorized to administer Virginia's NPS pollution reduction programs in accordance with §10.1-104.1 of the Code of Virginia and §319 of the Clean Water Act. USEPA is requiring that much of the §319 grant monies be used for the development of TMDLs. Because of the magnitude of the NPS component in the TMDL process, VADCR is a major participant in the TMDL process. VADCR has a lead role in the development of IPs to address correction of NPS pollution contributing to water quality impairments. VADCR also provides available funding and technical support for the implementation of NPS components of IPs. The staff resources in VADCR's TMDL program focus primarily on providing technical assistance and funding to stakeholders to develop and carry out IPs, and support to VADEQ in TMDL development related to NPS impacts. Under the Virginia Stormwater Management Program, VADCR is responsible for the issuance, denial, revocation, termination, and enforcement of National Pollutant Discharge Elimination System (NPDES) permits for the control of stormwater discharges from municipal separate storm sewer systems (MS4) and land disturbing activities. VADCR staff will be working with other state agencies, local governments, soil and water conservation districts, watershed groups, and citizens to gather support and to improve the implementation of TMDL plans through utilization of existing authorities and resources.

VDACS: The Virginia Department of Agriculture and Consumer Services Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken, which may include civil penalties. The Commissioner of Agriculture can issue an emergency

corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, *etc*. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures.

VDGIF: The Virginia Department of Game and Inland Fisheries manages Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth; provides opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation; and promotes safety for persons and property in connection with boating, hunting, and fishing. The VDGIF has responsibility for administering certain U.S. Fish and Wildlife Service funding programs. Personnel participate, review, and comment on projects processed through state and federal project and permitting review processes to insure the consideration for fish and wildlife populations and associated habitats.

VDH: The Virginia Department of Health is responsible for maintaining safe drinking water measured by standards set by the USEPA. Their duties also include septic system regulation. Like VDACS, VDH is complaint driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. For TMDLs, VDH has the responsibility of enforcing actions to correct failed septic systems and/or eliminate straight pipes (Sewage Handling and Disposal Regulations, 12 VAC 5-610-10 *et seq*.).

Virginia Department of Forestry (VADOF): The VADOF has prepared a manual to inform and educate forest landowners and the professional forest community on proper BMPs and technical specifications for installation of these practices in forested areas (www.dof.state.va.us/wq/wq-bmp-guide.htm). Forestry BMPs are intended to primarily control erosion. For example, streamside forest buffers provide nutrient uptake and soil stabilization, which can benefit water quality by reducing the amount of nutrients and sediments that enter local streams.

VCE: Virginia Cooperative Extension is an educational outreach program of Virginia's land grant universities (Virginia Tech and Virginia State University), and a part of the national Cooperative State Research, Education, and Extension Service, an agency of the United States Department of Agriculture (USDA). VCE is a product of cooperation among local, state, and federal governments in partnership with citizens. VCE offers educational programs and technical resources for topics such as crops, grains, livestock, poultry, dairy, natural resources, and environmental management. VCE has published several publications that deal specifically with TMDLs. For more information on these publications and to find the location of county extension offices, visit www.ext.vt.edu.

Regional and local government groups work closely with state and federal agencies throughout the TMDL process; these groups possess insights about their community that may help to ensure the success of TMDL implementation. These stakeholders have knowledge about a community's priorities, how decisions are made locally, and how the watershed's residents interact. Some local government groups and their roles in the TMDL process are listed here:

CSWCD: The Culpeper Soil and Water Conservation District is a local unit of government responsible for the soil and water conservation work within Culpeper, Greene, Madison, Orange, and Rappahannock Counties. The district's overall role is to increase voluntary conservation practices among farmers, ranchers, and other land users. District staff work closely with watershed residents and have valuable knowledge of local watershed practices. Specific to the TMDL implementation, the district will lead education and technical assistance efforts and track BMP implementation for the agricultural and residential programs.

Culpeper, Madison, and Rappahannock Counties and Town of Washington Government Departments: Government staff work closely with local and state agencies to develop and implement the TMDL. The staff may also help to promote education and outreach to citizens, businesses, and developers to introduce the importance of the TMDL process.

RRRC: Environmental planning is a long-standing area of emphasis of the RRRC, which is complementary to the TMDL process. RRRC continues to promote efficient development of the environment by assisting and encouraging local governmental agencies to plan for the future. TMDL development and implementation plan development have been contracted through the RRRC. RRRC will lead the pet waste management implementation with assistance from localities and CSWCD. Additionally, RRRC will continue to work with VADCR and the Steering Committee to periodically revisit implementation progress and suggest plan revisions as needed.

Citizens & Businesses: The primary role of citizens and businesses is simply to get involved in the TMDL process. This may include participating in public meetings, assisting with public outreach, providing input about the local watershed history, and/or implementing BMPs to help restore water quality.

RappFLOW: RappFLOW is a grassroots group of citizen volunteers founded in the summer of 2002, representing the varied interests of people who live in and around Rappahannock County, VA. The goal of RappFLOW is to build a shared base of knowledge among all stakeholders. From this knowledge, RappFLOW distills and prioritizes issues that are important to the citizens and to the protection of the watershed. This knowledge-building activity is viewed as foundational for future watershed management planning activities.

FOR: Friends of the Rappahannock was formed in 1985 as a non-profit, grassroots conservation organization, whose common goal is to maintain the water quality and scenic beauty of the Rappahannock River and its tributaries. FOR works with a wide variety of stakeholders, from local governments to elementary students, to educate about the river and to advocate for actions and policies that will protect and restore the values that make the Rappahannock River so special. FOR promotes environmentally responsible planning through active participation in the civic process. FOR professional staff provide technical support to local governments, developers, and teachers in areas of special expertise, including low impact development codes and ordinances, watershed planning, water quality monitoring, invasive species control, and streambank restoration.

Hughes River Partnership: Founded in 2008, Hughes River Partnership works with landowners in the Hughes River watershed to promote the development of conservation easements and encourage land use practices that support agricultural sustainability in the area.

RLEP: Rappahannock League for Environmental Protection hosts educational events and informative website on local environmental issues.

PEC: Piedmont Environmental Council safeguards the landscapes, communities and heritage of the Piedmont by involving citizens in related public policy and land conservation.

Community Civic Groups: Community civic groups take on a wide range of community service including environmental projects. Such groups include the Ruritan, Farm Clubs, Homeowner Associations and youth organizations such as 4-H and Future Farmers of America. These groups offer a resource to assist in the public participation process, educational outreach, and assisting with implementation activities in local watersheds.

Animal Clubs/Associations: Clubs and associations for various animal groups (*e.g.*, beef, equine, poultry, swine, and canine) provide a resource to assist and promote conservation practices among farmers and other landowners, not only in rural areas, but in residential areas as well.

9. INTEGRATION WITH OTHER WATERSHED PLANS

Each watershed within the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographical boundaries and goals. These include but are not limited to, the Chesapeake Bay 2000 agreement, Tributary Nutrient Reduction Plans, TMDLs, Roundtables, Water Quality Management Plans, Erosion and Sediment Control regulations, Stormwater Management Program, Source Water Assessment Program, and local comprehensive plans. In some cases, an IP may even address multiple TMDLs (*e.g.*, bacteria and benthic) for the same impaired water body. The progress of these projects or programs needs continuous evaluation to determine possible effects on implementation goals. For example, financial and technical resources may be maximized for implementation by coordinating and expanding the planning and implementation activities of these on-going watershed projects or programs. Current initiatives within Town of Washington and Culpeper, Madison, and Rappahannock Counties to be integrated with the Upper Hazel River TMDL IP include:

- Culpeper, Madison, and Rappahannock Counties Comprehensive Plans
- Town of Washington Comprehensive Plan
- CSWCD Septic System Program
- Town of Washington Waste Water Treatment Plant Construction
- Rappahannock County Easement Program
- Madison County Easement Program
- Madison County Asset mapping Project
- RappFLOW Strategic Plan
- Friends of the Rappahannock (FOR) Strategic Plan
- The Hughes River Partnership Strategic Plan
- Rappahannock League for Environmental Protection (RLEP) Strategic Plan
- Piedmont Environmental Council (PEC) Strategic Plan

10. POTENTIAL FUNDING SOURCES

Potential funding sources available during implementation were identified in the course of plan development. Detailed description of each source (*i.e.*, eligibility requirements, specifications, incentive payments) can be obtained from the CSWCD, VADCR, VADEQ, VADGIF, VCE, VDH, and NRCS. Sources include:

10.1 Federal Funding Sources

Federal Clean Water Act Section 319 Incremental Funds

USEPA develops guidelines that describe the process and criteria to be used to award CWA Section 319 NPS grants to states. States may use up to 20% of the Section 319 incremental funds to develop NPS TMDLs as well as to develop watershed-based plans for Section 303(d) listed waters. The balance of funding can be used for implementing watershed-based plans for waters that have completed TMDLs. Implementation of both agricultural and residential BMPs is eligible. VADCR administers the money, in coordination with the Nonpoint Source Advisory Committee (NPSAC), to fund watershed projects, demonstration and educational programs, nonpoint source pollution control program development, and technical and program staff. VADCR reports annually to the USEPA on the progress made in nonpoint source pollution prevention and control. http://www.epa.gov/owow/nps/319/319stateguide-revised.pdf

USDA Conservation Reserve Enhancement Program (CREP)

In Virginia, this is a partnership program between the USDA and the Commonwealth of Virginia, with the VADCR being the lead state agency. The program uses financial incentives to encourage farmers to enroll in contracts of 10 to 15 years or perpetual easements to remove lands from agricultural production. This program is an "enhancement" of the existing USDA CRP Continuous Sign-up. It has been "enhanced" by increasing the cost-share rates from 50% to 75% and 100%, increasing the rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Pasture and cropland (as defined by USDA) adjacent to streams, intermittent streams, seeps, springs, ponds and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, to mixed hardwood trees on pasture, must be established in widths ranging from the minimum of 30% of the floodplain or 35 feet, whichever is greater, to a maximum average of 300 feet. Cost-sharing (75% - 100%) is available to help pay for fencing to exclude livestock from the riparian buffer, watering facilities, hardwood tree planting, filter strip establishment, and wetland restoration. In addition, a 40% incentive payment upon completion is offered and an average rental rate of $70/acre on stream buffer area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area. The statewide goal is 8,000 acres. The landowner can obtain and complete CREP application forms at the FSA center. The forms are forwarded to local NRCS and SWCD offices while FSA determines land eligibility. If the land is deemed eligible, NRCS and the local SWCD determine and design appropriate conservation practices. A conservation plan is written, and fieldwork is begun, which completes the conservation practice design phase. FSA then measures CREP acreage, conservation practice contracts are written, and practices are installed. The landowner submits bills for cost-share reimbursement to FSA. Once the landowner completes BMP installation and

the practice is approved, FSA and the SWCD make the cost-share payments. The SWCD also pays out the state's one-time, lump sum rental payment. FSA conducts random spot checks throughout the life of the contract, and the agency continues to pay annual rent throughout the contract period. http://www.dcr.virginia.gov/soil_&_water/crep.shtml

USDA Conservation Reserve Program (CRP)

The program offers annual rental payments, incentive payments for certain activities, and cost-share assistance to establish approved cover on cropland. Contract duration is between 10 and 15 years, and cost-share assistance is provided up to 50% of costs. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration. Offers are accepted and processed during fixed signup periods that are announced by Farm Service Agency (FSA). All eligible (cropland) offers are ranked using a national ranking process. Payments are based on a per-acre soil rental rate. Cost-share assistance is available to establish the conservation cover of tree or herbaceous vegetation. The per-acre rental rate may not exceed the Commodity Credit Corporation's maximum payment amount, but producers may elect to receive an amount less than the maximum payment rate, which can increase the ranking score. To be eligible for consideration, the following criteria must be met: 1) cropland was planted or considered planted in an agricultural commodity two of the five most recent crop years; and 2) cropland is classified as "highly-erodible" by NRCS. Eligible practices include planting these areas to trees and/or herbaceous vegetation. Application evaluation points can be increased if certain tree species, spacing, and seeding mixtures that maximizes wildlife habitats are selected. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. http://www.nrcs.usda.gov/programs/crp/

USDA Environmental Quality Incentives Program (EQIP)

This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource needs and objectives. Approximately 65% of the EQIP funding for the state of Virginia is directed toward “Priority Areas.” These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. The purposes of the program are achieved through the implementation of an EQIP plan of operation, which includes structural and land management practices on eligible lands. Contracts up to ten years are written with eligible producers. Cost-share of 75%, 25% tax credit, and/or incentive payments are made available to implement one or more eligible conservation practices, such as animal waste management facilities, terraces, filter strips, tree planting, and permanent wildlife habitat. Incentive payments can be made to implement one or more management practices, such as nutrient management, pest management, and grazing land management. http://www.nrcs.usda.gov/programs/eqip/

Wetland Reserve Program (WRP)

The program provides an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal lands from agriculture. The program benefits include providing fish and wildlife habitat, improving water quality, reducing flooding, recharging

groundwater, protecting and improving biological diversity, and furnishing recreational and esthetic benefits. The program offers three enrollment options: permanent easements, 30-year easement, and restoration cost-share agreement (10-year agreement where USDA pays 75% of the restoration costs). Under the permanent easement option, landowners may receive the agricultural value of the land up to a maximum cap and 100% of the cost of restoring the land. For the 30-year option, a landowner will receive 75% of the easement value and 75% cost-share on the restoration. A ten-year agreement is also available that pays 75% of the restoration cost. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and may lease the land for hunting, fishing, or other undeveloped recreational activities. At any time, a landowner may request that additional activities be added as compatible uses. Land eligibility is dependent on length of ownership, whether the site has been degraded as a result of agriculture, and the land's ability to be restored. Restoration agreement participants must show proof of ownership. Easement participants must have owned the land for at least one year and be able to provide clear title. http://www.nrcs.usda.gov/programs/wrp/

Wildlife Habitat Incentive Program (WHIP)
WHIP is a voluntary program for landowners and land users who want to develop or improve wildlife habitat on private agriculture-related lands. USDA and the participant enter into a five to ten year cost-share agreement for wildlife habitat development. In Virginia, high priority habitat needs include: early grassland habitats that are home to game species such as quail and rabbit, as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share up to 75% is available for the cost of installing practices. Applicants will be competitively ranked within the state and certain areas and practices will receive higher ranking based on their value to wildlife. Types of practices include: disking, prescribed burning, mowing, planting habitat, converting fescue to warm season grasses, establishing riparian buffers, creating habitat for waterfowl, and installing filter strips, field borders and hedgerows. http://www.nrcs.usda.gov/programs/whip/

U.S. Fish and Wildlife Service Conservation Grants
Funds states to implement conservation projects to protect federally listed threatened or endangered species and species at risk. http://www.fws.gov/grants/state.html

U.S. Fish and Wildlife Service Private Stewardship Program
Funds individuals or groups engaged in local, private, and voluntary conservation efforts to benefit federally listed, proposed, or candidate species, or other at risk species.
http://www.fws.gov/endangered/grants/private_stewardship/index.html

National Fish and Wildlife Foundation
Private, non-profit 501c(3) tax-exempt organization that fosters cooperative partnerships to conserve wildlife, plants, and the habitats on which they depend. A General Challenge Grants Program and a Special Grants Program are offered. Grants are available to federal, state, and

local governments, educational institutions, and non-profit organizations through General Challenge Grants. Of particular interest is the Special Grant – Southern Rivers Conservation whereby on-the-ground projects are eligible to restore and enhance riparian and riverine habitat in twelve southeastern states, including Virginia. Stream restoration activities are eligible through this grant program. Offers are accepted throughout the year and processed during fixed signup periods. The signup periods are on a year-round, revolving basis, and there are two decision cycles per year. Each cycle consists of a pre-proposal evaluation, full proposal evaluation, and a Board of Directors decision. An approved pre-proposal is a pre-requisite to the submittal of the full proposal. Grants generally range between $10,000 and $150,000. Payments are based on need. Projects are funded in the U.S., and any international areas that host migratory wildlife from the U.S., marine animals, or endangered species. Grants are awarded for the purpose of conserving fish, wildlife, plants, and their habitats. If the project does not fall into the criteria of any special grant programs, the proposal may be submitted as a general grant if it falls under the following guidelines: 1) it promotes fish, wildlife and habitat conservation, 2) it involves other conservation and community interests, 3) leverages available funding, and 4) evaluates project outcomes. A pre-proposal that is not accepted by a special grant program may be deferred to the general grant program. http://www.nfwf.org/programs/grant_apply.htm

Chesapeake Bay Small Watershed Grants Program
Partnership between the EPA Chesapeake Bay Program and the National Fish and Wildlife Foundation that provides grants to organizations working on a local level to protect and improve watersheds in the Chesapeake Bay basin, while building citizen-based resource stewardship. http://www.nfwf.org/chespeake/index.htm

10.2 Virginia Funding Sources

Virginia Agricultural Best Management Practices Cost-Share Program
The Program is administered by VADCR to improve water quality in the state's streams, rivers and the Chesapeake Bay. The basis of the program is to encourage the voluntary installation of agricultural best management practices to meet Virginia's NPS pollution water quality objectives. This program is funded by the state Water Quality Improvement Fund (WQIF) and the federal Chesapeake Bay Program Implementation Grant monies through local Soil and Water Conservation Districts (SWCDs). Farmers and landowners are encouraged to use BMPs on their land to better control sediment, nutrient loss, and transportation of pollutants into our waters due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Program participants are recruited by SWCDs based upon those factors, which have a great impact on water quality. The objective is to solve water quality problems by fixing the worst problems first. Cost-share is typically 75% of the actual cost, not to exceed the local maximum. Each practice under the cost-share program has specifications and a lifetime during which the practice must be maintained. http://www.dcr.virginia.gov/sw/costshar.htm.

Virginia Agricultural Best Management Practices Tax Credit Program
The program provides a tax credit for approved agricultural BMPs that are installed to improve water quality in accordance with a conservation plan approved by the local SWCD. The goal of this program is to encourage voluntary installation of BMPs that will address Virginia's NPS pollution water quality objectives. For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, shall be allowed a credit against the tax imposed by Section 58.1-320 of an amount equaling 25% of the first $70,000 expended for agricultural best management practices by the individual. "Agricultural best management practices" are approved measures that will provide a significant improvement to water quality in the state's streams and rivers, and is consistent with other state and federal programs that address agricultural nonpoint source pollution management. Any practice approved by the local SWCD Board shall be completed within the taxable year in which the credit is claimed. The credit shall be allowed only for expenditures made by the taxpayer from funds of his/her own sources. The amount of such credit shall not exceed $17,500 or the total amount of the tax imposed by this program, whichever is less, in the year the project was completed, as certified by the Board. If the amount of the credit exceeds the taxpayer's liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. This program can be used independently or in conjunction with other cost-share programs on the stake holder's portion of BMP costs. It is also approved for use in supplementing the cost of repairs to streamside fencing. http://www.dcr.virginia.gov/sw/costshar.htm.

Virginia Water Quality Improvement Fund
This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible organizations include local governments, SWCDs, and individuals. Grants for point sources are administered through VADEQ and grants for nonpoint sources are administered through VADCR. Most WQIF grants provide matching funds on a 50/50 cost-share basis. A request for proposals is distributed annually. Successful applications are listed as draft/public-noticed agreements, and are subjected to a public review period of at least 30 days. Information is available at http://www.dcr.virginia.gov/sw/wqia.htm.

Virginia Small Business Environmental Compliance Assistance Fund
The program provides financial assistance to small businesses by providing loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural BMPs certified as eligible by VADCR. Interest rates are fixed at 3%, and the maximum loan available is $100,000. There is a $30 non-refundable application processing fee. The program will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act. http://www.dba.state.va.us/financing/programs/small.asp

Virginia Landowner Incentive Program
To protect and restore biological diversity, the VDGIF is providing financial and technical assistance to private landowners through the Landowner Incentive Program (LIP). LIP is a federal grant program funded by US Fish and Wildlife Service and administered by VDGIF. It can provide cost-share of 75% of conservation project costs to landowners willing to install and maintain stream restoration and riparian buffer projects on their property for a minimum of 10 years. These LIP projects are undertaken to improved degrading lands, reduce sediment in streams, and improve critical habitats for at risk species. A complete list of species ranked according to their need for conservation in Virginia, can be found in the Virginia Wildlife Action Plan, which is available at http://bewildvirginia.org/

Virginia Clean Water Revolving Loan Programs
The Virginia Clean Water Revolving Loan Fund (VCWRLF), previously known as the Virginia Revolving Loan Fund, was created in 1987. The Department of Environmental Quality, on behalf of the State Water Control Board (SWCB), manages the VCWRLF, administering the policy aspects of the Fund, receiving applications and providing funding recommendations to the SWCB. The Virginia Resources Authority (VRA) serves as the financial manager of the Fund. Initially, the VCWRLF included a single program which was established to provide financial assistance in the form of low-interest loans to local governments for needed improvements at publicly-owned wastewater treatment facilities and/or collection systems. In 1999, 2001 and 2003 the scope of VCWRLF activity was expanded by the State Water Control Board and DEQ implemented additional programs to provide low interest loans related to agricultural and other non-point source water quality issues. The following loan programs are now operated within the Virginia Clean Water Revolving Loan Fund. http://www.deq.state.va.us/cap/wwovrvew.html

Community Development Block Grant Program (HUD/CDBG)
The Community Development Block Grant (CDBG) program is a flexible program that provides communities with resources to address a wide range of unique community development needs. Beginning in 1974, the CDBG program is one of the longest continuously run programs at HUD. The CDBG program provides annual grants on a formula basis to 1180 general units of local government and States. http://www.hud.gov/offices/cpd/communitydevelopment/programs/

Rural Community Assistance Program
The overall goal is to facilitate and foster sustainable community development -- linking community assistance and resource management. Throughout the country our rural community assistance efforts focus around the themes of healthy communities, appropriately diverse economies, and sustainable ecosystems. http://www.fs.fed.us/spf/coop/programs/eap/rca.shtml

10.3 Regional Funding Sources

Southeast Rural Community Assistance Project (Southeast RCAP)
The mission of this project is to promote, cultivate, and encourage the development of water and wastewater facilities to serve low-income residents at affordable costs and to support other development activities that will improve the quality of life in rural areas. Staff members of other

community organizations complement the Southeast RCAP central office staff across the region. They can provide (at no cost to a community): on-site technical assistance and consultation, operation and maintenance/management assistance, training, education, facilitation, volunteers, and financial assistance. Financial assistance includes $1,500 toward repair/replacement/installation of a septic system and $2,000 toward repair/replacement/installation of an alternative waste treatment system. Funding is only available for families making less than 125% of the federal poverty level. The federal poverty threshold for a family of four is $18,850. http://www.sercap.org

10.4 Private Funds

Chesapeake Bay Foundation
The Chesapeake Bay Foundation (CBF) is a catalyst for bold and creative solutions to Bay problems. Staff members set the agenda, serve as watchdogs, and speak out on behalf of the Chesapeake Bay to business, government, and the public. The CBF partners with a variety of organizations to provide grants and funding for projects in favor of preserving the Chesapeake Bay. http://www.cbf.org

Krebser Foundation
The Krebser Fund is maintained as a separate account at the Piedmont Foundation, a 509(a)(3) supporting organization with accounts and investment management separate from PEC and its operating accounts. A KFRCC advisory committee, which includes representation from the PEC Board, the Rappahannock League for Environmental Protection (RLEP), the Rappahannock Farmers' Association (RFA), and the Rappahannock County Conservation Association (RCCA) has been established. Acquisitions of land or easements involving KFRCC monies will be limited to Rappahannock County. http://www.pecva.org/anx/index.cfm/1,154,348,-1,html

Piedmont Environmental Council (PEC)
A community group dedicated to safeguarding the landscapes, communities and heritages of the Piedmont of Virginia http://www.pecva.org

Friends of the Rappahannock (FOR)
Friends of the Rappahannock (FOR) was formed in 1985 as a non-profit, grassroots conservation organization. Its mission is to be the *Voice* and *Active Force* for a healthy and scenic Rappahannock River. The organization works with a wide variety of stakeholders, from local governments to elementary students, to educate about the river and to advocate for actions and policies that will protect and restore the values of the Rappahannock River.
http://www.riverfriends.org

LIST OF ACRONYMS

AWG	Agricultural Working Group
BMP	Best Management Practice
CCU	Confined Canine Unit
CREP	Conservation Reserve and Enhancement Program
CRP	Conservation Reserve Program
CSWCD	Culpeper Soil and Water Conservation District
CWA	Clean Water Act
ECI	Engineering Concepts, Inc.
EQIP	Environmental Quality Incentive Program
FOR	Friends of the Rappahannock
FR-1	Reforestation of Erodible Crop and Pastureland
FTE	Full Time Equivalent
GWG	Government Working Group
IP	Implementation Plan
LID	Low Impact Development
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
OSSDS	On-Site Sewage Disposal System
RB-1	Septic System Pump-Out
RB-2	Connection of Malfunctioning OSSDS or Straight Pipe to Public Sewer
RB-3	Septic Tank System Repair
RB-4	Septic Tank Installation / Replacement
RB-5	Alternative On-Site Waste Treatment System
RCAP	Rural Community Assistance Program
RRRC	Rappahannock-Rapidan Regional Commission
RWG	Residential Working Group
SL-1	Permanent Vegetative Cover on Cropland
SL-6	Grazing Land Protection System
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
VADCR	Virginia Department of Conservation and Recreation
VADEQ	Virginia Department of Environmental Quality
VADOF	Virginia Department of Forestry
VCE	Virginia Cooperative Extension
VDACS	Virginia Department of Agriculture and Consumer Services
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
WQIF	Water Quality Improvement Fund
WQMIRA	Water Quality Monitoring, Information and Restoration Act
WHIP	Wildlife Habitat Incentive Program
WRP	Wetland Reserve Program

GLOSSARY

Anthropogenic - involving the impact of humans on nature; specifically items or actions induced, caused, or altered by the presence and activities of humans.

Assimilative Capacity - a measure of the ability of a natural body of water to effectively degrade and/or disperse chemical substances. Assimilative capacity is used to define the ability of a waterbody to naturally assimilate a substance without impairing water quality or degrading the aquatic ecosystem. Numerically, it is the amount of pollutant that can be discharged to a specific waterbody without exceeding water quality standards. (see Loading Capacity)

Bacterial Source Tracking (BST) - A collection of scientific methods used to track sources of fecal coliform.

Best Management Practices (BMPs) - reasonable and cost-effective means to reduce the likelihood of pollutants entering a water body. BMPs include riparian buffer strips, filter strips, nutrient management plans, conservation tillage, etc.

Die-off (of fecal coliform) - Reduction in the fecal coliform population due to predation by other bacteria as well as by adverse environmental conditions (e.g., UV radiation, pH).

Cost-share Program - a program that allocates project funds to pay a percentage of the cost of constructing or implementing a BMP. The remaining costs are paid by the producer(s).

Delisting - the process by which an impaired waterbody is removed from the Section 303(d) Impaired Waters List. To remove a waterbody from the Section 303(d) list, the state must demonstrate to USEPA, using monitoring or other data, that the waterbody is no longer impaired.

Discharge - flow of surface water in a stream or canal or the outflow of groundwater from a flowing artesian well, ditch or spring; can also apply to discharge of liquid effluent from a facility or to chemical emissions into the air through designated venting systems.

Erosion - detachment and transport of soil particles by water and wind. Sediment resulting from soil erosion represents the single largest source of nonpoint source pollution in the United States.

Failing septic system - Septic systems in which drain fields have failed such that effluent (wastewater) that is supposed to percolate into the soil, now rises to the surface and ponds on the surface where it can flow over the soil surface to streams or contribute pollutants to the surface where they can be lost during storm runoff events.

Fecal coliform - A type of bacteria found in the feces of various warm-blooded animals that is used as indicator of the possible presence of pathogenic (disease causing) organisms.

Full Time Equivalent (FTE) - is calculated by dividing the total number of paid hours by the number of hours in a time period.

Geographic Information System (GIS) - a system of hardware, software, data, people, organizations and institutional arrangements for collecting, storing, analyzing and disseminating information about areas of the earth. An example of a GIS is the use of spatial data for Emergency Services response (E-911). Dispatchers use GIS to locate the caller's house, identify the closest responder, and even determine the shortest route. All these activities are automated using the electronic spatial data in the GIS.

Geometric mean - The geometric mean is simply the nth root of the product of n values. Using the geometric mean lessens the significance of a few extreme values (extremely high or low values). In practical terms, this means that if you have just a few bad samples, their weight is lessened. Mathematically the geometric mean, $\bar{x}_g$, is expressed as: $\bar{x}_g = \sqrt[n]{x_1 \cdot x_2 \cdot x_3 \ldots x_n}$ where n is the number of samples, and x_i is the value of sample i.

HSPF (Hydrological Simulation Program-Fortran) - A computer-based model that calculates runoff, sediment yield, and fate and transport of various pollutants to the stream. The model was developed under the direction of the U.S. Environmental Protection Agency (EPA).

Impaired waters - those waters with chronic or recurring monitored violations of the applicable numeric and/or narrative water quality standards.

Instantaneous criterion - The instantaneous criterion or instantaneous water quality standard is the value of the water quality standard that should not be exceeded at any time. For example, the Virginia instantaneous water quality standard for fecal coliform is 1,000 cfu/100 mL. If this value is exceeded at any time, the water body is in exceedance of the state water quality standard.

Load allocation (LA) - portion of the loading capacity attributed to 1) the existing or future nonpoint sources of pollution, and 2) natural background sources. Wherever possible, nonpoint source loads and natural loads should be distinguished.

Loading capacity (LC) - greatest amount of pollutant loading a waterbody can receive without violating water quality standards. (see assimilative capacity)

Margin of safety (MOS) - a required component of the TMDL that accounts for the uncertainty in calculations of pollutant loading from point, nonpoint, and background sources.

Modeling - a system of mathematical expressions that describe both hydrologic and water quality processes. When used for the development of TMDLs, models can estimate the load of a specific pollutant to a waterbody and make predictions about how the load would change as remediation steps are implemented.

Monitoring - periodic or continuous sampling and measurement to determine the physical, chemical, and biological status of a particular media like air, soil, or water.

Nonpoint source pollution - pollution originating from multiple sources on and above the land. Examples include runoff from fields, stormwater runoff from urban landscapes, roadbed erosion in forestry, and atmospheric deposition.

Nutrient - any substance assimilated by living things that promotes growth. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements.

Pathogen - Disease-causing agent, especially microorganisms such as certain bacteria, protozoa, and viruses.

Point source pollution - pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants or industrial treatment facilities or any conveyance such as a ditch, tunnel, conduit or pipe from which pollutants are discharged. Point sources have a single point of entry with a direct path to a water body. Point sources can also include pollutant loads contributed by tributaries to the main receiving stream or river.

Riparian - pertaining to the banks of a river, stream, pond, lake, etc., as well as to the plant and animal communities along such bodies of water

Runoff - that part of precipitation, snowmelt, or irrigation water that does not infiltrate but flows over the land surface, eventually making its way to a stream, river, lake or an ocean. It can carry pollutants from the land and air into receiving waters.

Sediment - in the context of water quality, soil particles, sand, and minerals dislodged from the land and deposited into aquatic systems as a result of erosion.

Septic system - An on-site system designed to treat and dispose of domestic sewage. A typical septic system consists of a tank that receives liquid and solid wastes from a residence or business and a drainfield or subsurface absorption system consisting of a series of tile or percolation lines for disposal of the liquid effluent. Solids (sludge) that remain after decomposition by bacteria in the tank must be pumped out periodically.

Simulation - The use of mathematical models to approximate the observed behavior of a natural water system in response to a specific known set of input and forcing conditions. Models that have been validated, or verified, are then used to predict the response of a natural water system to changes in the input or forcing conditions.

Stakeholder - any person or organization with a vested interest in TMDL development and implementation in a specific watershed (e.g., farmer, landowner, resident, or business owner)

Straight pipe - Delivers wastewater directly from a building, e.g., house or milking parlor, to a stream, pond, lake, or river.

Total Maximum Daily Load (TMDL) - a pollution "budget" that is used to determine the maximum amount of pollution a waterbody can assimilate without violating water quality standards. The TMDL includes waste load allocations (WLAs) for permitted point sources, load allocations (LAs) for nonpoint and natural background sources, plus a Margin of Safety (MOS). A TMDL is developed for a specific pollutant and can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to a state's water quality standard.

Transitional land use - areas of sparse vegetative cover (less than 25 percent of cover) that are dynamically changing from one land cover to another, often because of land use activities. Examples include forest clearcuts, a transition phase between forest and agricultural land, the temporary clearing of vegetation, and changes due to natural causes (e.g. fire, flood, etc.).

Wasteload allocation (WLA) - the portion of a receiving water's loading capacity that is allocated to one of its existing or future permitted point sources of pollution. WLAs constitute a type of water quality-based effluent limitation.

Water quality - the biological, chemical, and physical conditions of a waterbody. It is a measure of a waterbody's ability to support beneficial uses.

Water quality standards - a group of statements that constitute a regulation describing specific water quality requirements. Virginia's water quality standards have the following three components: designated uses, water quality criteria to protect designated uses, and an anti-degradation policy.

Watershed - area that drains to, or contributes water to, a particular point, stream, river, lake or ocean. Larger watersheds are also referred to as basins. Watersheds range in size from a few acres for a small stream, to large areas of the country like the Chesapeake Bay Basin that includes parts of six states (see, drainage basin).

APPENDIX A

Agricultural Working Group Meeting Notes

AGRICULTURAL WORKING GROUP SEPTEMBER 16, 2008 MEETING SUMMARY

Group Membership

- The following individuals were present at the meeting: Augie Vogel, Beth Pastore, Bev Hunter, Bob Anderson, Bob Miller, Bob Slusser, Byron Petrauskas, Caroline Parrish, Charlie Lunsford, Chris Parrish, David Massie, Don Lock, Edward Dorsey, Greg Wichelns, Herbert M. Reynolds, Jim Gannon, Katie Conaway, Melissa H. Allen, and Phillip Hurst

Overview

- The requirement to develop a TMDL implementation plan, number of implementation plans throughout the state, and implementation progress was discussed.
- Potential practices listed in the Virginia Agricultural BMP Handbook that may be utilized during implementation were discussed
- Other BMPs such as pasture management system and manure/biosolids incorporation were noted
- Spatial analysis to determine streamside fencing (e.g., one-sided, two-sided, or none) was outlined. It was pointed out that RappFLOW had examined aerial photographs to determine stream-side buffer zones; however, it was difficult from some aerial photographs to actually tell whether there were buffers in place. To diminish this uncertainty, it will be important to cross check information with the Culpeper SWCD, NRCS, Virginia Cooperative Extension, producers, and AWG.

Education / Outreach

- Concerns that most producers in the watershed already know about BMPs and have been approached about implementing the cost-share practices. What will be different now from past?
    - It was noted in the Fauquier TMDL IP that not all farmers knew everything about all the programs available especially the new / transitional land owners or renters.
- Steps taken in the Fauquier TMDL IP included
    - Joint letter with VDH sent to all land owners in the watershed
    - Water quality letter sent to all land owners in the watershed
    - Watershed investigation to determine areas to target
    - Outreach to targeted areas from full time staff member

Cost-share / Potential Funding Sources

- CREP is a big program in Rappahannock County
- The Culpeper SWCD pointed out that it is possible to combine multiple programs in order to increase the cost-share percentage. Larger farm tracts installing buffers have a greater chance of obtaining cost-share near 100%. Typical cost-share for smaller farm tracts is 50% – 90%.
- Concerns were expressed that details for all the programs were difficult to follow. This could be a big hindrance to getting folks involved and interested in implementing BMPs. Typical paperwork associated with an easement was suggested as an appropriate style for explaining programs.
- Explanation was used that cost-share program is a trade-off => producer fences stream and receives a clean water source
- It was noted that incentive payment of $200/ac for pasture management system detailed in the Fauquier TMDL IP was high and a lesser payment, yet to be determined, should be expected. Question was asked whether any private funding had actually been utilized to provide support for BMP implementation in the Fauquier TMDL implementation project
    - Response was private funding support was in the planning stage and not utilized to date
- Potential private funding sources mentioned were: Chesapeake Bay Funders and Friends of the Rappahannock River

- Non-government funding may have less stringent requirements for BMP installation (e.g., shorter buffer distance) that some producers may only be willing to meet.
- It was discussed that using two-strand electric poly-wire fencing at top of the streambank would remove the direct deposition load from livestock, but not treat the bacteria land load. Therefore, the fencing would be counted in the implementation efforts as addressing livestock direct deposition only.

Implementation Constraints / Concerns

- Stream water is easy water (i.e., easily accessible and free)
- Loss of good bottom-land pasture to buffer
- Loss of shade
  - Will portable shade structures be included in cost-share?
- Replacement of fence after a flood event
  - A 75% cost-share to replace fence is available with the SL-6 and WP-2T state cost-share practices.
- Invasive plant species in buffer
- Buffer aesthetics
  - What are the buffer maintenance requirements?

Other

- Concern was raised regarding the direct pathway to streams ditches alongside roadways provide.
- Questions were raised about what legal action could be taken to enforce implementation.
  - Agricultural Stewardship Act allows citizens to submit complaints about bad agricultural practices observed to be detrimental to the environment. The complaint is investigated by the Department of Agriculture and remedial actions prescribed if deemed necessary. Bacteria are not referenced in the act; however, will be considered in next revision.
  - House Bill 1150 directs the state to develop action plan to clean-up impaired waters, part of process will be looking at necessary regulations
- Impact farm ponds could have on bacterial loadings was discussed
- Cost estimates from Fauquier TMDL IP could be adjusted for 2008

AGRICULTURAL WORKING GROUP NOVEMBER 18, 2008 MEETING SUMMARY

Group Membership
The following individuals were present at the meeting: Bev Hunter, Bev Jones, Bob Slusser, Bryant Lee, Byron Petrauskas, David Massie, Debbie Cross, Don Lock, Greg Wichelns, Helen Dixon, James Henshaw, Jenn Allen, Jim Gannon, Joe Rossetti, Katie Conaway, Kaye Kohler, Melissa H. Allen, Mike Massie, Rick Kohler, Ron Frazier, and Vivian Yancey.

Meeting Topics and Discussion Summary
Brief review of the September meeting minutes was presented prompting questions regarding TMDL process and water quality issues in the state. Summary of discussion follows:

- It was stated that there are state-wide water quality issues especially for the Chesapeake Bay and unclear why the project is focused in Rappahannock County, when there are so many urbanization and runoff issues in Northern Virginia and around Richmond, Virginia.
- Population control was noted as the main environmental issue that needs to be addressed. > It was stated that more trees, wildlife abundance, and lower pH of soil due to acid rain are the environmental changes in Rappahannock County over the last 40 years.
- Questions were raised as to the pollution extent of the streams; such as, the level sample concentrations were above the bacteria standard and comparison to other streams in Rappahannock and surrounding counties.
- Health risk associated with these streams was questioned. Several people indicated that swimming and drinking water in past occurred without adverse effects. Response included no knowledge of reported outbreaks in watersheds; however, illness can be falsely categorized as originating from another source because of similar symptoms (e.g., influenza).

A handout was distributed addressing:

1. Livestock Direct Deposition Bacteria Load
2. Pasture Bacteria Load
3. Cropland Bacteria Load
4. Milestones / Timeline
5. Priority / Targeting

Summary of discussion pertaining to the handout follows:

- Livestock exclusion fencing presented was for major streams only. Comments were made that all perennial streams need to be included in the analysis. Analysis evaluation using all perennial streams will be presented at the next Agricultural Working Group meeting.
- It was noted that fencing out livestock from the stream channels would also prevent wildlife access to the stream corridors.
- In higher elevations, lowland pasture areas along streams may be the only feasible area to raise livestock. Fencing this area and creating a 35-feet buffer would greatly diminish the land available to raise livestock for certain farmers.

- Concern was raised that a producer participating in cost-share programs may incur upfront expenses and not get reimbursed for several months. This would certainly be a deterrent especially in our current economy.
- Incentive payment for the proposed pasture management system was discussed. Incentive payment needs to cover labor, gas, harrow, etc. to ensure incentive is attractive to producer.
- It was noted that easements can be a good option; but, are not appropriate for everyone.
- Concern was raised whether converting agricultural land uses to buffers would compromise eligibility for agriculture land use status.
- Overall, group believed cropland acreage listed in TMDL report over-estimates actual area in watersheds. Generally, substantial manure collection from confined beef cows is not prevalent in these watersheds.

AGRICULTURAL WORKING GROUP JANUARY 12, 2009 MEETING SUMMARY

Group Membership
The following individuals were present at the meeting:
Augustus Vogel, Bob Slusser, Byron Petrauskas, Charlie Lunsford, David Massie, Debbie Cross, Deirdre Clark, Don Loock, Edward Dorsey, Greg Wichelns, Harold Hiner, James Henshaw, John McCarthy, Katie Conaway, and Melissa H. Allen

Meeting Topics and Discussion Summary
No comments were made regarding the September and November Agricultural Working Group meeting minutes distributed in a handout

Successes of other TMDL implementation projects were presented along with handouts describing the Middle Fork Holston River / Three Creeks, North River, and Willis River implementation projects. Highlights of projects include:

- Residential and agricultural technicians were hired as part of the Middle Fork Holston River / Three Creeks project in Washington County. During six years of implementation, fencing totaling 23 miles and excluding 2,700 animals from streams has been installed.
- North River watershed is located in Rockingham County, the most intensive agricultural county in Virginia. Volunteer fencing installed by Old Order Mennonite community has been crucial to success of project, fostered by relationships built by Mike Phillips (Shenandoah Valley SWCD).
- Peter Francisco SWCD has lead the Wills River implementation efforts in Cumberland and Buckingham Counties. In three years, fencing totaling 23 miles has been installed. A portion of the impairment is now meeting the bacteria water quality standard and is a candidate for de-listing.
- Implementation has been ongoing for three years in Thumb Run, Carter Run, Great Run, and Deep Run watersheds in Fauqier County. Technicians with John Marshall SWCD and VDH were funded to address agricultural and residential components, respectively. Harold Heiner, a beef producer in Carter Run watershed, shared his experience with installation of 4,000 feet of fencing and a new watering system through the cost-share program. Mr. Heiner indicated the overall herd health was better, less calves have been lost, and the district worked well to meet his needs.
- Overall, successes have been relationships formed with local community to assist with correcting failed septic systems, evidence of improved herd health, and improved property values.

- A handout was distributed addressing livestock direct deposition bacteria load.
- All perennial streams in the watershed previously used were utilized to determine the total stream length, streamside fencing, and exclusion systems needed to reduce the livestock direct deposition load. These estimates were approximately three times previous estimates derived using just the main streams.
- Point was made that implementation plan time-frame does not allow for adequate "ground-truth" of fencing estimates. Majority of "ground-truth" generally occurs during implementation phase.
- Current exclusion fencing installed in the watersheds was partially accounted for in the analysis. Maps with exclusion fencing were distributed to Culpeper SWCD to further assist in updating fencing estimates.
- The group agreed actual fencing needed was between estimate using main stream and estimates using all perennial streams, but a decision was not made as to how to derive that estimate.

Summary of discussion addressing constraints and/or incentives to implementation follows:

Livestock Exclusion Fencing

- A new BMP eligible in TMDL implementation areas would reduce buffer width to 10 feet and fencing specification requirements, at 50% cost-share, to address concerns that 35-feet buffer and NRCS fencing requirements for stream exclusion are too stringent.
- Loss of shade is less of an issue for beef cows versus dairy cows. Cost-share for portable shade structures was deemed unnecessary.
- Equipment not animals is allowed in buffers for maintenance.
- Cost-share for fence replacement after a flood event is offered in TMDL implementation areas. Specification does not list number of times producer is eligible.
- Question regarding whether a producer can exclude main stem and not tributary was asked. CSWCD explained the evaluation is on a field-per- field basis and addresses all surface water.
- Given amount of exclusion fencing required, implementation timeline should be 10 years.

Pasture management system

- Specification drafted by DCR; however, incentive payment not finalized. An incentive payment between $75/ac to $100/ac with a cap on number of acres is anticipated.

Cost-share program

- No suggestions were made for updating programs to make it easier for first time participants.
- Timely reimbursement of producer expenses has occurred in district and is anticipated to not be an issue during implementation.

Land-use conversion

- Previous concern whether converting agricultural land use to buffers would compromise eligibility for agriculture land use status was discussed. According to representatives from Rappahannock County, the topic spawned from another issue in

county not pertaining to TMDL implementation and the land use would be classified as a BMP under the agricultural land-use category.

APPENDIX B

Residential Working Group Meeting Notes

RESIDENTIAL WORKING GROUP SEPTEMBER 16, 2008 MEETING SUMMARY

In attendance were:
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The meeting began with a review of the watershed maps and a discussion of recent efforts by the Culpeper Soil and Water Conservation District (CSWCD) to remediate impacts to surface water from straight pipes and failing septic systems. CSWCD's role in implementing the Septic System Cost Share Program of Rappahannock County's Clean Streams Initiative was described. Details concerning outreach efforts and the program's success were provided. It was noted that newspaper ads and direct mailings to those whose properties lie within 300' of stream banks generated a substantial number of inquiries, many of which resulted in inspections and remedial actions. Stream walks, visual observations of suspect properties and conversations with land owners were some of the methods used to identify possible problems. The importance of educating the public about the impacts of failing septic systems was emphasized. It was noted that although most families were interested in cost-sharing the improvement expenses, some actively declined any assistance of any kind. Improvement and assistance options offered by the program include pump-outs, inspections, repairs and new systems. Evan offered to provide statistics on the types of improvements completed to date. He and Ted mentioned that although this particular program is limited to Rappahannock County, there are funds available statewide to assist low income families with septic system problems. Concerns for budget impacts to agency staffing were discussed. Noting the significant achievements of the CSWC /Rappahannock partnership, the question regarding funding to continue these efforts was raised. Possible support from local non-profit groups was discussed. All agreed that funding for any activities beyond the key concerns of most groups is unlikely, but efforts will be made to inform them of the opportunity to support such programs. Local groups mentioned include rappFLOW, Rappahannock County Conservation Alliance and RLEP.

Problems with failing drainfields in the Town of Washington, the proposed sewage treatment plant construction and challenges associated with providing service to town residents were discussed. It was noted that local soil types, water table characteristics and topography often challenge the efficiency and function of traditional septic systems. Alternative systems or traditional systems with pumps are sometimes needed. These exceed the $6,000 - $8,000 costs typically associated with the installation of traditional systems.

Various approaches to educating the public were discussed. Mention was made of the importance of educating pet owners and owners/managers of facilities where large numbers of dogs are kenneled. The relative values and effectiveness of brochures, radio ads and websites were mentioned. It was agreed that popular local web sites (i.e. rappvoice and rappnet) provide good opportunities for posting public information, as does rappFLOW's home page. Because of likely funding limitations, it was agreed that those properties closest to surface water should be targeted for priority attention.

The meeting of the Residential Work Group adjourned at 9:10 P.M.

RESIDENTIAL WORKING GROUP NOVEMBER 18, 2008 MEETING SUMMARY

Attendance:

The following individuals were present: Tim Bondelid, May Sligh, Ted Bullard, BJ Valentine, Bob Slusser, Ron Makela, Jan Makela, Kaye Kohler and Deirdre Clark

Overview

Confined canine facilities were discussed

- Information was requested regarding how facilities such as veterinary offices and SPCAs are currently handling waste. This request will be brought to the attention of the Government Working Group.
- Hunt kennel facilities often spread the waste on fields
    - Foxhunter Association and Horse Country Database may help locate facilities within the TMDL IP watershed
- Pet waste management stations recommended for locations such as The Link in Sperryville and the park in Washington
- Outreach information on proper pet waste management could be distributed at vet offices, the SPCA, dog license packets, etc
- Different systems were discussed
- Traditional septic systems, composting, decomposition with enzyme additives Septic System Problems
- Lack of statewide pump-out requirements
    - Information was requested regarding pump-out requirements in Culpeper, Madison or Rappahannock counties. This concern will be brought to the attention of the Government Working Group.
    - Require pump-outs at time of sale of property?
- Question of inspector certification
    - Attending realtors were skeptical of adequacy of current inspection protocols
    - Termite inspectors are conducting septic system inspections
    - Waste haulers could be contacted to find gaps or provide more data

Alternative systems are costly

- Soils in the TMDL IP area may limit the use of standard septic systems
    - Cost-share to include alternative systems, repair and pump-out

Education/ Outreach

There is a lack of information on drainfield and septic tank location on individual properties

- It was suggested to work with local and state Board of Realtors to establish requirements to include septic system information, such as location and function, in all applicable real-estate transactions
- Realtors could distribute septic system management pamphlets
  Septic system education
- Integration of information into school curricula.
    - Include within programs presented by local soil and water conservation districts
- Promotion of better understanding of grey water and water re-use

Cost-Share/ Potential Funding Sources

Cost-share program concerns to be researched by the Government Working Group

- Will the program include mapping the septic system location with a copy provided to the landowner?
    - Prevent future damage (tree planting, vehicle movement, etc)
- In order to determine the success of improvements to residential waste treatment systems, will stream monitoring continue to be conducted by DEQ? If so, for how long?

Funding

- There is more money for agricultural practices and less for residential purposes
- A recent EPA Environmental Education Grant (RFP-EPA-EE-09-02 http://www07.grants.gov/search/search.do?&mode=VIEW&flag2006=false&oppId=43316) could provide opportunities for realtors to develop informational materials and for programs to be developed for students.
- Other potential funding sources during the 5 yr. implementation phase:
- Water Quality Improvement Fund
- National Fish & Wildlife Foundation
- Community Foundation
- Chesapeake Bay Foundation

APPENDIX C

Governmental Working Group Meeting Notes

GOVERNMENT WORKING GROUP JANUARY 12, 2009 MEETING SUMMARY

Daniel Technical Center – Germanna Community College – Culpeper, VA

Attendance:

Bob Anderson, Rappahannock County, Rappahannock-Rapidan Regional Commission
Todd Benson, Piedmont Environmental Council
Tim Bondelid, RappFLOW
Parker Bullard, VA Dept. of Health
Win Carithers, Culpeper County
Deirdre Clark, Rappahannock-Rapidan Regional Commission
Katie Conaway, VA Dept. of Environmental Quality
Debbie Cross, VA Dept. of Conservation and Recreation
Lynn Crump, VA Dept. of Conservation and Recreation
Paul Hernandez, Culpeper County
Charles Lunsford, VA Dept. of Conservation and Recreation
David Massie, Culpeper Soil and Water Conservation District
John McCarthy, Rappahannock County
Byron Petrauskas, Engineering Concepts, Inc.
Herbert Reynolds, VA Dept. of Forestry
Rex Rexrode, USDA Natural Resources Conservation Service
Lisa Robertson, Madison County
Charles Shepherd, VA Dept. of Health
May Sligh, VA Dept. of Conservation and Recreation
Greg Wichelns, Culpeper Soil and Water Conservation District
Whitney Wright, VA Dept. of Health

Responsibilities

The primary responsibilities of the Government Work Group are:

- Identify funding sources and technical resources currently available;
- Evaluate additional programs/technical resources that could enhance implementation;
- Identify lead agencies for agricultural and residential implementation;
- Identify regulatory controls currently in place that could promote water quality improvement efforts; and
- Discuss monitoring component.

Introduction:

- The TMDL-IP process was reviewed as were the importance of, and opportunities for, public participation through public meetings, Ag and Residential Working Groups and Steering Committee meetings.

Overview

On-site Sewage Disposal Systems

- The success of the Culpeper SWCD septic system cost share project in Rappahannock County was discussed. An extension of the current grant through the Water Quality Improvement Fund and applicability to a greater project area has been requested.
- For the most part, public funding for the repair or installation of residential drain fields is focused on those situations characterized by financial need and environmental impact.
- There are no 319 funds available for mandatory hook-ups (Town of Washington); some assistance possible from state revolving loan fund

- State and Local Requirements:
  - Reserve Drainfield
    - 100% reserve in all three counties for new lots
  - Alternative Systems
    - All must have maintenance agreements and tracking system as of July 1, 2009
    - Culpeper – random inspections at reasonable intervals.
    - Madison – tested twice/ yr.
    - Rappahannock – maintenance and monitoring plan
  - Pump-out
    - Culpeper – as needed or as required by Health Dept.
    - Madison County - no pump out requirements
    - Rappahannock County – no pump out requirement but education program encourages that it be done once every 5 years
  - Uniformity in pumping requirements and an effective tracking system is needed. The Residential Working Group discussed the need for change in real estate law to require pump-out, on-site sewage disposal system management information and system location as part of every closing document packet.

- **Residential and Commercial Pet Waste**
  - The Residential Working Group stated the need to identify and locate confined canine operations – hunt clubs, kennels (private and commercial), veterinarians, and shelters and determine method of waste management.
  - Dog licensing requirements may offer an opportunity to distribute pet waste management information. Other opportunities may exist at veterinary office, private and commercial kennels, hunt clubs, etc. Outreach effort may work in Rappahannock Co but not sure about Madison Co. Dog license requirements are usually posted in newspapers, not by way of individual letters
  - Portable pet composters are recommended for use on residential properties. These devices use enzymes to break down solids. Effluent leaving the composter is treated as it enters the soil profile.

- **Agriculture**
  - Two new stream exclusion cost-share practices that target TMDL implementation areas (e.g. Upper Hazel) became effective on January 15, 2009. One practice provide 50% cost-share for stream fencing, water supply, pipeline, water troughs, and cross fencing to establish grazing paddocks. The fence setback requirement from the top of the streambank is 10 feet and the minimum fencing requirement is two-strand electrified polywire/polytape. The practice has a 10-year life span requirement and must be inspected every two years by the local Soil and Water Conservation District.
  - The second BMP practice requires a 35' minimum buffer and is funded at 85% cost share.

- **Wildlife**
  - Canadian geese have been identified as contributing to contaminants in local ponds. As migratory water fowl, they are protected by federal law. Numbers generally drop in areas where vegetated pond buffers are maintained.

- **Funding**

- Up to $50,000 may be available from the Krebser Foundation in 2009 to close the gap between cost share amounts and full cost needed to implement BMPs. This will be available only in Rappahannock County.
- DCR has $32,709 of Section 319 funds (federal) available for technical assistance in the Upper Hazel River watershed in 2009. This funding would go to the Culpeper SWCD. In addition, $162,500 of cost-share funding will be available in 2009 through the Virginia Water Quality Improvement Fund for targeted agricultural BMP implementation in the Upper Hazel.
- The Culpeper Soil and Water Conservation District has already committed 80% – 85% of its $800,000 allocation for BMPs for fiscal year 2009.
- Greater flexibility in BMPs may encourage greater participation in programs by landowners.

- **Proposed Responsibilities/Roles of Government Agencies in Implementation Plan**
  - Assistance is needed from local governments to assure that AG BMPs are in place and maintained for the required 10 year period typical of most state and federal programs.
  - Local governments are encouraged to develop mechanisms to retain buffers over the long term.
  - Government agencies at all levels are encouraged to develop and implement educational programs for pet waste management and septic system maintenance.

- **Water Quality Improvement Issues**
  - There is evidence of improved livestock health as a result of stream exclusion.
  - Bacteria and nutrient problems go hand-in-hand.
  - Horses should be included in BMP programs. Educational programs should be geared to all livestock owners.
  - Revise the Ag Stewardship Act to include pathogens (complaints are investigated by VDACS in cooperation with the local SWCD.)
  - Current pending legislation would limit a locality's ability to regulate alternative septic systems.

- **Water Quality Monitoring**
  - As part of its on-going monitoring program, DEQ will continue to monitor the Hughes River at Route 644 and the Hazel River at Route 729. Monitoring at these locations will be six times a year (every other month) on an annual basis. DEQ also plans to monitor other stations in the Upper Hazel River Watershed, including the Thornton River at Route 626 and Route 729 (six times a year, every other month, on an annual basis), Popham Run, the North Fork Thornton River, and an Unnamed Tributary to the Thornton River (every-other month from 2009 – 2010).
  - It was suggested that a monitoring station be located on the Rush River at Route 683, the original listing station for the Rush River. This location will provide data for tracking changes in the watershed related to the implementation plan.
  - RappFLOW (www.RappFLOW.org), a citizen interest group, regularly monitors streams in Rappahannock County and has recently completed an extensive water quality study of the county.
    Monitoring includes benthic, physical and chemical characteristics. Their macroinvertebrate program is managed by Culpeper Soil and Water Conservation District.

- **Public Participation**
  - RappFLOW has compiled detailed documentation of the state of the streams of Rappahannock County. They also hold workshops on various water quality related issues and assist with advertising the TMDL-IP meetings.
  - The Hughes River Partnership, focused primarily on land use and management issues, promotes maintaining and/or improving the water quality of the Hughes as a key factor in maintaining sustainable agriculture in the watershed.
  - RLEP (Rappahannock League for Environmental Protection) hosts educational events and informative website on local environmental issues

APPENDIX D

Steering Committee Meeting Notes

STEERING COMMITTEE FEBRUARY 23, 2009 MEETING SUMMARY

Rappahannock-Rapidan Regional Commission - Culpeper, VA

Attendees

Tim Bondelid, RappFLOW
Parker Bullard, VA Dept. of Health
Deirdre Clark, Rappahannock-Rapidan Regional Commission
Katie Conaway, VA Dept. of Environmental Quality
Debbie Cross, VA Dept. of Conservation and Recreation
Bev Hunter, RappFLOW
Laura Loveday, Culpeper County
David Massie, Culpeper Soil and Water Conservation District
Byron Petrauskas, Engineering Concepts, Inc.
Lisa Robertson, Madison County
Jim Schaberl, National Park Service, Shenandoah National Park
May Sligh, VA Dept. of Conservation and Recreation
BJ Valentine, RappFLOW
Greg Wichelns, Culpeper Soil and Water Conservation District

Meetings to Date

- First public meeting – September 16, 2008
- Agricultural Working Group meetings- September 16, 2008; November 18, 2008; January 12, 2009
- Residential Working Group meetings – September 16, 2008, November 18, 2008
- Government Working Group meeting – January 12, 2009

Working Group Reports

- Residential – Thirteen individuals participated in the two Residential Working Group meetings. Mr. Timothy Bondelid, RappFLOW, summarized key recommendations made by the members of the Residential Working Group and expanded upon them by describing specific management practices and implementation strategies. The following issues were reviewed:
  - The use of Low Impact Development to moderate the impacts of construction on hydrology;
  - The value of riparian buffers;
  - Basic eco-friendly land management practices;
  - Recognizing non-bovine livestock (horses, et al) as contributors to water quality problems;
  - The importance of education as provided to students in schools and to home buyers by realtors.

  Clarification is needed regarding:
  - Phasing of the construction of the wastewater plant in Washington and delivery of service to residents;
  - Locations of confined canine facilities.
- Agricultural - Thirty-one individuals participated in the three Agricultural Working Group Meetings. Mr. Petrauskas, Engineering Concepts, Inc., reviewed the group's recommendations. The following issues were discussed:
  - The need for a 10 year implementation timeline;
  - The importance of pursuing private funding sources and non-government funded implementation options;

- The continuing concern by landowners that recommended practices will become mandatory;
- The need for flexibility in practices and funding to encourage participation in BMP programs;
- The fact that agriculture as a land use is valued by all residents of the region.

- Governmental – Twenty-one individuals participated in the Governmental Working Group meeting. Mr. Greg Wichelns, Culpeper Soil and Water Conservation District, presented the group's recommendations. In discussing issues associated with on-site sewage treatment systems, concern was expressed regarding currently proposed legislation that would limit a locality's ability to regulate alternative treatment systems in any way. Possible limitations of cost share funds in the installation of these systems were discussed. Information was provided to the group regarding:
  - The role of the Virginia Department of Agriculture and Consumer Services;
  - Other funding sources including NRCS;
  - Private funding would be needed to provide shade structures for livestock.

  Clarification is needed to determine whether pump-out funding might be available to citizens in Washington should systems fail prior to the availability of public sewer.

Questions/Comments/Concerns

- Group members questioned whether the entire upper Hazel watershed should be included in the TMDL-IP. All agreed that logic would suggest that it be included.
  - If the decision is made to include the whole watershed, should priority be given to the current IP area for the implementation of practices?
- Ground-truthing of livestock exclusions is part of the technical assistance offered by the Culpeper Soil and Water Conservation District.
- The National Park Service does not monitor for bacteria, but will make their monitoring data available. In addition, they welcome groups in the park to conduct coliscan monitoring. The continuation of NPS' monitoring program depends upon funding.

What's Next?

- The next Steering Committee Meeting will be held on March 30th, 2009 at the R-RRC office in Culpeper.
  - The public document prepared by Engineering Concepts for the Public Meeting will be available for review.
  - The power-point presentation prepared for April 23rd's Public Meeting will be reviewed.
- The Public Meeting will be held on April 23rd, 2009 at the Firehouse in Washington, VA.

STEERING COMMITTEE MARCH 30, 2009 MEETING SUMMARY
Rappahannock-Rapidan Regional Commission - Culpeper, VA

Attendees

Jenn Allen, Friends of the Rappahannock
Tim Bondelid, RappFLOW
Deirdre Clark, Rappahannock-Rapidan Regional Commission
Katie Conaway, VA Dept. of Environmental Quality
Debbie Cross, VA Dept. of Conservation and Recreation
Bev Hunter, RappFLOW
Don Loock, Piedmont Environmental Council
Kenner Love, Virginia Cooperative Extension Service
John McCarthy, Rappahannock County
David Massie, Culpeper Soil and Water Conservation District
Byron Petrauskas, Engineering Concepts, Inc.
May Sligh, VA Dept. of Conservation and Recreation
BJ Valentine, RappFLOW
Greg Wichelns, Culpeper Soil and Water Conservation District

Meetings to Date

- First Public Meeting – September 16, 2008
- Agricultural Working Group meetings- September 16, 2008; November 18, 2008; January 12, 2009
- Residential Working Group meetings – September 16, 2008, November 18, 2008
- Government Working Group meeting – January 12, 2009
- First Steering Committee Meeting – February 23, 2009

AGENDA REVIEW

- Steering Committee Meeting Notes – February 23, 2009: Reviewed and accepted as written.
- Government Working Group Report to Steering Committee - Revised: oIn response to comments regarding the format and content of the Government Working
    - Group report to the Steering Committee, the document was revised. Changes included separating Key Topics and Recommendations, grouping, summarizing and clarifying certain aspects of the report and removing a reference interpreted as ascribing regulatory authority to the Government Working Group. All changes were accepted as written.
- **Implementations Chart Review** – suggested changes include:
    - Shade column headings;
    - Include definitions for all acronyms; and
    - Eliminate abbreviations.
- **Draft Public Document Plan Review** –
    - Noted that the Public Document is a condensed version of the Technical Plan as developed with input from the public in response to the TMDL;
    - Issues discussed include:
        - Projected implementation costs - high due to the large number of streams in the region and high number of livestock exclusion practices needed;
        - Well water quality;

- Surface/groundwater relationship - identified as a greater concern in karst and coastal plain areas;
- Connection between water quality and herd health;
- Economic benefits of clean water to tourism – tourism, fishing, aesthetics, etc.
- Pet waste issues and proposed management practices should be handled in a reasonable manner;
- Numbers of pet waste composters recommended might be reduced if buffers were included;
- Check monitoring station locations – route numbers/road crossings;
- Check monitoring schedule; and
- Consider adding new monitoring stations – Battle Run, Hazel River (outlet of watershed), and Rush River.

o Recommended changes include:

- **Bold** Working Group names in the text;
- Assure that numbers/details in narrative match those in the tables and that details are easily understood -for example, Table 2 seems to suggest 60 FTEs; however, the text clarifies the need for an equivalency of 6 FTEs over a 10 year period;
- Assure that colors in all figures are easily distinguished;
- Include reference to "Streamside Livestock Exclusion" publication by Benham, Lunsford and Zeckoski;
- Include a paragraph regarding surface/groundwater interaction;
- Tailor comments in "Benefit Analysis" to the watershed.
- Include comments from local farmers regarding benefits of Ag BMP programs;
- Include information in text to support photographs of alternative on-site sewage disposal system (p.27).
- Numbers of pet waste composter proposed should reasonably reflect the number of households where the practice might be applicable;
- Include cost share funds for hardwood riparian buffers to reflect availability of stimulus funds for carbon sequestration; and
- Include a text reference that LE-1T and LE-2T stream exclusion practices will be cost-share eligible even though numbers are not quantified in the IP, and
- Adjust Table 6 to reflect needed changes in locations and monitoring schedule.

- **Power-Point Preview:**

o Issues discussed include:

- Importance of presenting information in a manner that is readily understandable by all members of the public;
- Change of language to "Clean Water Action Plan" rather than TMDL-IP;
- Emphasis should be on the watershed, not just particular stretches of streams;
- Emphasize the connection between herd health and exclusion fencing;
- Can terminology other than "BMP" be used to convey information;
- Importance of citizen involvement in the IP development;
- Explain "cost share";
- Concern for the role of the average citizen in the I.P. and;
- How does the presentation reach those with no interest in livestock?

o Recommended changes include:

- Include information on the potential numbers of riparian buffers that might be created;
- Add information on pasture management;

- Adjust slide on sewage treatment systems to de-emphasize alternative systems;
- Include DEQ's slide to demonstrate measurable goals and milestones;
- Funding costs should include "average";
- Remove monitoring text – use map only;

- **Public Meeting Outreach** – advertising will include:
  - Signs and bulletins posted throughout the watershed;
  - Local newspapers postings in "Events" column;
  - Postings in electronic newspapers and bulletin boards; and
  - E-mails to those who have participated in previous meetings.
- **Reporting and Integrated Data Management;**
  - Linear feet of fencing installed and number and types of BMPs developed and implemented ,along with all funds allocated, are tracked by CSWCD and DCR (agricultural practices) and the Virginia Department of Health (septic practices);
  - The CSWCD, along with DCR, will work on tracking the implementation of agricultural BMPs identified in the IP, including those not funded through cost-share programs;
  - Water quality is tracked by way of DEQ monitoring; and
  - Currently, there is no mechanism to track and integrate all bacteria source reduction actions that take place in the Upper Hazel across all agencies programs and stakeholder efforts.

Next Steps:

- The final public meeting will be held at the Washington Fire House, 10 Firehouse Lane, Washington, VA on April 23, 2009 at 7P.M.
  - The power-point presentation, as reviewed and edited, will be presented; and
  - Citizens will have the opportunity to ask questions and provide comments.

APPENDIX E

Public Meeting Notes

PUBLIC MEETING APRIL 23, 2009 SUMMARY

Washington Firehouse - Washington, Virginia

Attendance:

Jeremy Bernstein, Citizen
Evan Blumenstein, Culpeper Soil and Water Conservation District
Tim Bondelid, RappFLOW
Susan Cable, Blue Ridge Foothills Conservancy
Deirdre Clark, Rappahannock-Rapidan Regional Commission
Katie Conaway, VA Dept. of Environmental Quality
Debbie Cross, VA Dept. of Conservation and Recreation
Edward Dorsey, Citizen
Jenny Fitzhugh, Citizen
Ben Grace, Citizen
Rita Grace, Citizen
Anne Hansen, Citizen
Peter Hansen, Citizen
Don Loock, Piedmont Environmental Council
Charles Lunsford, VA Dept. of Conservation and Recreation
Marc Malik, Citizen
Bob Marshall, Citizen
Paulette Marshall, Citizen
David Massie, Culpeper Soil and Water Conservation District
John McCarthy, County Administrator, Rappahannock County
Byron Petrauskas, Engineering Concepts, Inc.
Monira Rifaat, Director, Culpeper Soil and Water Conservation District
Walker Rowe, Citizen
David Sligh, Citizen
May Sligh, VA Dept. of Conservation and Recreation
Carolyn Thornton, Citizen
BJ Valentine, RappFLOW
Virginia Valentine, RappFLOW
Greg Wichelns, Culpeper Soil and Water Conservation District

Introduction:

- Mr. John McCarthy, Rappahannock County Administrator, welcomed attendees and introduced Byron Petrauskas, Engineering Concepts, Inc. and Charles Lunsford, Virginia Department of Conservation and Recreation.
- Mr. Lunsford provided an historical review of the TMDL-IP program, noting that the Upper Hazel TMDL-IP is one of 22 similar projects in the Commonwealth, all of which have been developed in the same manner. Mr. Lunsford stated that no new regulations had been created as a result of the TMDL-IP process and that regulations regarding the use of straight pipes and the repair of failing septic systems were already in place.

Project Review:

- Through the use of a power-point presentation, copies of which were provided to attendees, Mr. Petrauskas reviewed the Upper Hazel River TMDL Implementation Plan development history and process.

Information Provided: In response to question from attendees, the following information was provided by the panel made up of Katie Conaway, Charles Lunsford, John McCarthy, Byron Petrauskas, May Sligh and Greg Wichelns:

- All proposed water quality improvement practices are voluntary – this is an incentive based program with up to 85% of total costs of agricultural practices being funded through cost-share;
- Part of the TMDL-IP process includes identifying existing regulations;
- The Agricultural Stewardship Act allows neighbors to anonymously file legal complaints against property owners whose agricultural practices are negatively impacting the complainant's property. This act doesn't address bacterial impacts. Complaints filed under this law are no greater in number in TMDL-IP study areas that in other watersheds;
- State law requires the development of an implementation plan; there is no requirement that the plan actually be implemented;
- Updated water quality monitoring information is posted on DEQ's website. The Steering Committee may request some other publicly accessed mechanism for tracking data/report cards;
- Recent legislation(SB1276) requires that the location of alternative on-site sewage treatment systems be shown on deeds of record – no such requirement applies to conventional systems;
- Issues associated with septic systems in flood plains are best addressed by relocating the system, if possible;
- There is no factor included in the model that may be used to identify specific properties as sources of bacterial loading;
- Coliscan monitoring is a quick, inexpensive way to identify levels of concentration of bacteria; Wildlife impacts are acknowledged as factors that may prevent reaching water quality improvement goals in this watershed;
- Although water quality may be favorable for macro-invertebrates, it may not be suitable for humans; citizen monitoring of benthics in the Thornton River has consistently scored 12, the highest score in benthic assessments and an indicator of very favorable conditions for these organisms; a low score may reflect contamination due to an excess of nutrients;
- Ordinarily, cost share programs cover 75% of the proposed BMP; cost share funding for BMPs with watersheds with TMDL-IPs is 85%. If demand exceeds fund availability, projects could be prioritized;
- Other than benefits provided through participation in CREP, there is no compensation to farmers for land taken out of production to install BMPs;
- There are new fencing options that reduce the buffer to 10 ft;
- The Krebser fund may be used to partner with cost-share funding in Rappahannock County to a total of $50,000 to assist with the farmer’s cost share portion;
- The importance of preserving and protecting the resource in the headwaters region was recognized.

What's Next?

Attendees were encouraged to comment on the draft document, copies of which were available at the meeting. They were informed that all meeting notes, maps and presentations, as well as the draft document, may be viewed on-line at http://www.rrregion.org/tmdl_hhr.html. The public comment period is open for thirty days.

APPENDIX F

Working Group Reports to Steering Committee

AGRICULTURAL WORKING GROUP REPORT TO STEERING COMMITTEE

Working Group Members:

Jenn Allen – Friends of the Rappahannock
Melissa Allen – John Marshall Soil and Water Conservation District
Bob Anderson – Chair, Rappahannock County, Board of Supervisors; R-RRC Board; Farmer
Debbie Cross – Department of Conservation and Recreation
Greg Dixon – Farmer
Helen Dixon – Farmer
Edward Dorsey – Citizen
Ron Frazier – Rappahannock County, Board of Supervisors
James Henshaw – Citizen
Bev Hunter – RappFLOW
Phillip Hurst – Citizen
Bev Jones – Citizen
Kaye Kohler – Realtor, Citizen
Rick Kohler – Realtor, Citizen
Bryant Lee – Rappahannock County, Board of Supervisors
Don Lock – Piedmont Environmental Council
Charlie Lunsford – Department of Conservation and Recreation
David Massie – Culpeper Soil and Water Conservation District
Mike Massie – Farmer
John McCarthy – Rappahannock County
Bob Miller – Madison County, Board of Supervisors; R-RRC Board
Caroline Parrish - Citizen
Chris Parrish – Rappahannock Farm Bureau
Beth Pastore – Piedmont Environmental Council
Byron Petrauskas – Engineering Concepts, Inc.
Herbert Reynolds – Virginia Department of Forestry
Joe Rossetti – Virginia Department of Forestry
Bob Slusser – Department of Conservation and Recreation
Augustus Vogel – Farmer
Greg Wichelns – Culpeper Soil and Water Conservation District
Vivian Yancey – Citizen

Meeting Dates:

- September 16, 2008
- November 18, 2008
- January 12, 2009

Responsibilities

The Agricultural Working Group (AWG) addressed the sources of bacteria that can be attributed to agricultural operations. The group focused on identifying obstacles to implementation of best management practices to reduce bacteria coming from agricultural operations, and practical solutions to these obstacles. Reductions in bacteria coming from agricultural operations can be achieved by decreasing direct deposition of fecal matter in the streams by livestock and reducing the amount of bacteria being carried across the land to the stream network during storm events. The group focused on the following tasks:

- Identify constraints to the implementation of best management practices,
- Consider alternative best management practices that are both effective and more affordable for the participants,
- Identify alternative funding sources/partnerships that will promote implementation,
- Identify timeline for achieving implementation goals, and
- Review implementation strategies from an agricultural perspective.

Key Topics and Recommendations

The following is a summary of issues discussed and recommendations from the three AWG meetings:

Overview

- Potential practices listed in the Virginia Agricultural BMP Handbook that may be utilized during implementation were discussed.
- Other BMPs such as pasture management system and manure/biosolids incorporation were noted.

Stream Fencing Estimates

- Spatial analysis to determine streamside fencing (e.g., one-sided, two-sided, or none) was outlined. It was pointed out that RappFLOW had examined aerial photographs to determine stream-side buffer zones; however, it was difficult from some aerial photographs to actually tell whether there were buffers in place. To diminish this uncertainty, it will be important to cross check information with the Culpeper SWCD, NRCS, Virginia Cooperative Extension, producers, and AWG.
- Livestock exclusion fencing estimates initially presented to the AWG were for major streams only. Comments were made at the 2nd meeting that all perennial streams needed to be included in the analysis. At the 3rd meeting, it was decided to take the all perennial stream estimate and consider what adjacent pasture land has grazing animals that needed to be excluded from the stream.

Education / Outreach

- Concerns that most producers in the watershed already know about BMPs and have been approached about implementing the cost-share practices. What will be different now from past?
    - It was noted in the Fauquier TMDL IP that not all farmers knew everything about all the programs available especially the new / transitional land owners or renters.
- Steps taken in the Fauquier TMDL IP included

- Water quality letter sent to all land owners in the watershed
- Watershed investigation to determine areas to target
- Outreach to targeted areas from full time staff member

Cost-share / Potential Funding Sources

- CREP is a big program in Rappahannock County.
- The Culpeper SWCD pointed out that it is possible to combine multiple programs in order to increase the cost-share percentage. Larger farm tracts installing buffers have a greater chance of obtaining cost-share near 100%. Typical cost-share for smaller farm tracts is 50% – 90%.
- Concerns were expressed that details for all the programs were difficult to follow. This could be a big hindrance to getting folks involved and interested in implementing BMPs. Typical paperwork associated with an easement was suggested as an appropriate style for explaining programs.
- Explanation was used that cost-share program is a trade-off => producer fences stream and receives a clean water source
- It was noted that incentive payment of $200/ac for pasture management system detailed in the Fauquier TMDL IP was high and a lesser payment, yet to be determined, should be expected. Question was asked whether any private funding had actually been utilized to provide support for BMP implementation in the Fauquier TMDL implementation project
    - Response was private funding support was in the planning stage and not utilized to date
- Potential private funding sources mentioned were: Chesapeake Bay Funders and Friends of the Rappahannock River
    - Non-government funding may have less stringent requirements for BMP installation (e.g., shorter buffer distance) that some producers may only be willing to meet.
    - It was discussed that using two-strand electric poly-wire fencing at top of the streambank would remove the direct deposition load from livestock, but not treat the bacteria land load. Therefore, the fencing would be counted in the implementation efforts as addressing livestock direct deposition only.

Implementation Constraints / Concerns

- Stream water is easy water (i.e., easily accessible and free)
- Loss of good bottom-land pasture to buffer
- Loss of shade
- Replacement of fence after a flood event
- Invasive plant species in buffer
- Buffer aesthetics
- Buffer requirement of 35-feet would greatly reduce the land available to raise livestock for certain farmers.
- Up-front expenses and not getting reimbursed for several months

Other

- Concern was raised regarding the direct pathway to streams ditches alongside roadways provide.

- Questions were raised about what legal action could be taken to enforce implementation.
  - Agricultural Stewardship Act allows citizens to submit complaints about bad agricultural practices observed to be detrimental to the environment. The complaint is investigated by the Department of Agriculture and remedial actions prescribed if deemed necessary. Bacteria are not referenced in the act; however, will be considered in next revision.
  - House Bill 1150 directs the state to develop action plan to clean-up impaired waters, part of process will be looking at necessary regulations
- Impact farm ponds could have on bacterial loadings was discussed
- Easements can be a good option, but not appropriate for everyone.

Recommendations

- CREP program or equivalent incentives need to continue to ensure participation in BMP programs.
- Incentive payment for proposed pasture management system needs to reflect energy costs, since fuel would constitute majority of farmer's cost to implement.
- Potential private funding sources and/or partnerships needs to be pursued during
  - implementation. (e.g., Chesapeake Bay Funders and Friends of the Rappahannock River). Implementation options afforded by non-government funding should be covered with
  - producers.
- Due to amount of exclusion fencing required, implementation timeline should be at least 10 years.
- Livestock exclusion and pasture load reductions should be a priority over cropland load reductions. Cropland acreage listed in TMDL report over-estimates actual area in watersheds and substantial manure collection and land application from confined beef cows is not prevalent in these areas.
- Future implementation actions and/or requirements should consider the viability of an individual producer or agricultural as a whole. Overall, Rappahannock County residents appreciate the farming community and rural aspects of the county and do not want it impacted.
- Two new stream exclusion fencing practices offered through the state cost-share program, effective January 15, 2009, address buffer-width, fencing specifications, and increased level of incentives concerns that were discussed by the AWG.

GOVERNMENT WORKING GROUP REPORT TO STEERING COMMITTEE

Working Group Members:

Bob Anderson, Rappahannock County, Rappahannock-Rapidan Regional Commission
Todd Benson, Piedmont Environmental Council
Tim Bondelid, RappFLOW
Parker Bullard, VA Dept. of Health
Win Carithers, Culpeper County
Deirdre Clark, Rappahannock-Rapidan Regional Commission
Katie Conaway, VA Dept. of Environmental Quality
Debbie Cross, VA Dept. of Conservation and Recreation
Lynn Crump, VA Dept. of Conservation and Recreation
Paul Hernandez, Culpeper County
Charles Lunsford, VA Dept. of Conservation and Recreation
David Massie, Culpeper Soil and Water Conservation District
John McCarthy, Rappahannock County
Byron Petrauskas, Engineering Concepts, Inc.
Herbert Reynolds, VA Dept. of Forestry
Rex Rexrode, USDA Natural Resources Conservation Service
Lisa Robertson, Madison County
Charles Shepherd, VA Dept. of Health
May Sligh, VA Dept. of Conservation and Recreation
Greg Wichelns, Culpeper Soil and Water Conservation District
Whitney Wright, VA Dept. of Health

Meeting Date: January 12, 2009

Responsibilities

The primary responsibilities of the Government Work Group are:

- Identify funding sources and technical resources currently available;
- Evaluate additional programs/technical resources that could enhance implementation;
- Identify lead agencies for agricultural and residential implementation;
- Identify regulatory controls currently in place that could promote water quality improvement efforts; and
- Discuss monitoring component.

Key Topics and Recommendations

- **On-site sewage disposal systems:**
    - Uniformity in pumping/maintenance requirements is needed;
    - Develop and implement a system for tracking septic system pump-outs and maintenance;
    - Require periodic pump-outs;
    - Require that information regarding residential septic system management and drain field
    - location be part of closing documentation at transfer of property;
    - Develop and implement educational programs focused on septic system design, function
    - and maintenance;
    - Public funding for the repair or installation of residential drain fields is usually focused on those situations characterized by financial need and environmental impact; and

- There are no 319 funds available for mandatory hook-ups (Town of Washington); some assistance possible from state revolving loan fund.

- **Pet Waste:**
  - All confined canine facilities should be identified, located and their method of waste management determined;
  - No County restrictions or ordinances regarding the management of pet waste have been identified;
  - Develop and implement educational/outreach programs to inform the public of appropriate pet waste management practices;
  - Promote the installation and use of enzyme waste composters for pet waste treatment; and
  - Promote and support the development and implementation of proper waste management practices at all confined canine facilities.

- **Agriculture**
  - Implementation of current BMPs on the area's farmland, characterized by hilly terrain and multiple drainage swales, is viewed by many as an impediment to viable agricultural operations. Cost share amounts and buffer requirements discourage participation in the program.
  - A new stream exclusion cost-share practice became effective on January 15, 2009 that is targeted to TMDL implementation areas (e.g., Upper Hazel). The practices provide 50% cost-share for stream fencing, water supply, pipeline, water troughs, and cross fencing to establish grazing paddocks. The fence setback requirement from the top of the streambank is 10 feet and the minimum fencing requirement is two-strand electrified polywire/polytape. The practice has a 10-year life span requirement and has to be inspected ever two years by the local Soil and water Conservation District.
  - BMP program flexibility will be needed to attract more participants in this area;
  - Horse operations, and other non-bovine livestock facilities, should be included in the BMP program.

- **Wildlife**
  - Promote pond bank buffers to discourage Canadian geese activity near ponds. This will limit their impacts to water quality.

- **Regulatory Controls**
  - Revise the Agricultural Stewardship Act to include pathogens;
  - Prioritize easement projects with precedence given to those properties with riparian buffers in place, or with the potential for their timely implementation;
  - Develop and implement requirements or incentives for the installation and/or maintenance of riparian buffers; and
  - Oppose current pending legislation that would limit a locality's ability to regulate alternative waste-water treatment systems.

- **Primary Funding Sources**
  - Identify funding sources for the construction or repair of septic systems in rural areas;
  - Identify funding sources to assist land owners in Washington, VA with hook-up fee requirements for the currently proposed wastewater treatment plant;

- Up to $50,000 may be available from the Krebser Foundation in 2009 to close the gap between cost share amounts and full cost needed to implement BMPs. If available, funding will be limited to Rappahannock County;
- Federal funding in the amount of $162,000 for BMPs in the Upper Hazel will be available in 2009. Administered through the CSWCD, funding will support one part-time technical assistant. DCR has available $32,709 of Section 319 funds (federal) for technical assistance in the Upper Hazel River watershed in 2009. This funding would go to the Culpeper SWCD. In addition, $162,500 of cost-share funding will be available in 2009 through the Virginia Water Quality Improvement Fund for targeted agricultural BMP implementation in the Upper Hazel; and
- Work with the Culpeper Soil and Water conservation District to identify and implement appropriate cost share programs.

- **Water Quality Monitoring**
  - As part of its on-going monitoring program, DEQ will continue to monitor the Hughes River at Route 644 and the Hazel River at Route 729. Monitoring at these locations will be six times a year (every other month) on an annual basis. DEQ also plans to monitor other stations in the Upper Hazel River Watershed, including the Thornton River at Route 626 and Route 729 (six times a year, every other month, on an annual basis), Popham Run, the North Fork Thornton River, and an Unnamed Tributary to the Thornton River (every-other month from 2009 – 2010).
  - It was suggested that a monitoring station be located on the Rush River at Route 683, the original listing station for the Rush River. This location will provide data for tracking changes in the watershed related to the implementation plan.
  - RappFLOW (www.RappFLOW.org), a citizen interest group, regularly monitors streams in Rappahannock County and has recently completed an extensive water quality study of the county.
  - Monitoring includes benthic, physical and chemical characteristics. Their macroinvertebrate program is managed by Culpeper Soil and Water Conservation District.

- **Local Interest and Activities**
  - RappFLOW, a citizen interest group dedicated to the protection, preservation and improvement of streams and watersheds in Rappahannock County, regularly conducts water quality studies, conservation workshops and educational event. Interested citizens are welcome to attend all functions.
  - The Hughes River Partnership, founded in 2008, works with landowners in the Hughes River watershed to promote the development of conservation easements and encourage land use practices that support agricultural sustainability in the area.
  - RLEP (Rappahannock League for Environmental Protection) hosts educational events and informative website on local environmental issues

RESIDENTIAL WORKING GROUP REPORT TO STEERING COMMITTEE

Working Group Members:
Evan Blumenstein, Culpeper Soil and Water Conservation District
Tim Bondelid, RappFLOW
Parker Bullard, VA Dept. of Health
Deirdre Clark, Rappahannock-Rapidan Regional Commission
Katie Conaway, VA Dept. of Environmental Quality
Gretchen Gorecki, Rappahannock-Rapidan Regional Commission
Hal Hunter, Resident – Rappahannock County
Kaye Kohler, Realtor, Resident, Rappahannock County
Jan Makela, Realtor, Resident - Rappahannock County
Ron Makela, Resident – Rappahannock County
May Sligh, VA Dept. of Conservation and Recreation
Bob Slusser, VA Department of Conservation and Recreation
BJ Valentine, Resident - Washington, VA

Meeting Dates:
September 16, 2008
November 18, 2008

Responsibilities
As was their responsibility, the Residential Working Group (RWG) focused on human sources of bacteria in the watershed, including failing septic systems, uncontrolled discharges of human sewage into streams (straight pipes) and pet waste. The RWG discussed different ways to reduce bacteria from these sources, identified problems associated with achieving bacterial load reductions and practical solutions to these problems. Specifically, the group was expected to address the following tasks:

- How to identify and eliminate straight pipes and failing septic systems serving dwellings and small businesses;
- Identification of difficulties faced by landowners in correcting these problems;
- Identification of potential funding sources to make necessary corrections;
- 'How to motivate owners of problem properties who may fear regulatory action and/or unknown costs;
- Evaluation of technical assistance needed and how to deliver such assistance;
- Identification of relevant educational tools; and
- Identification of effective ways to reduce bacteria from pet waste.

As is typically the case, this working group was made up of local residents, a representative from a local citizen organization, and staff members from state and local agencies.

Key Topics and Recommendations
The following is a summary of issues discussed and recommendations from both RWG meetings:

- **On-site sewage disposal systems –**
  - **Concerns:**
    - Lack of state-wide pump-out requirements;
    - Unqualified individuals are inspecting and certifying drainfields for home sales;

- There are no 319 funds available for mandatory hook-ups (Town of Washington); some assistance possible from state revolving loan fund.
- Soils in TMDL-IP area may limit use of traditional septic systems;
- Alternative systems are costly to install and maintain;
- Identification of problem source may be difficult – may include neighbor observation, stream walks, conversations with landowners;
- Some owners with failing systems will not accept any cost share assistance;
- How to reach and convince landowners to repair faulty systems? In Rappahannock County, newspaper ads and direct mailings to owners with properties within 300feet of stream banks generated interest and resulted in improvements

  - **Recommendations:**
    - Pump-out should be required at time of property sale and/or require periodic pump-outs;
    - Uniformity in pumping/maintenance requirements is needed;
    - Develop and implement a system for tracking septic system pump-outs and maintenance;
    - Require that information regarding residential septic system management and drain field location be part of closing documentation at transfer of property;
    - Develop and implement educational programs focused on septic system design, function and maintenance; and
    - Develop and implement educational programs focused on:
    - Impacts of failing drainfields
    - Mechanics of drainfield function – include this information in closing documents at time of property sale;
    - Require that drainfield locations be accurately recorded on plats of all new homes with septic systems;
    - Expand the scope of Rappahannock's Clean Streams Initiative to include the TMDL –IP area;

- **Education/Outreach**
  - Lack of understanding on how septic systems function
    - Integrate information into school curricula, particularly Earth Science and Health; and
    - Include information in educational programs presented by Culpeper Soil and Water Conservation District (CSWCD).
  - Drainfield and tank location and layout, as well as system type, are often unknown or incomplete
    - Require new property plat to include system location and layout
  - Promote information on stormwater capture and use, as well as grey water re-use. CSWCD successfully used door-hangers, newspaper ads and direct mailings to owners of properties within 300' of a stream. These tactics generated inquiries to CSWCD, resulting in inspections and remedial action; and
  - Realtors could distribute septic system management literature.
- **Pet Waste/Confined Canine Operations**
  - **Concerns:**
    - Lack of pet waste management ordinances/requirements within the region;
    - No standardization of waste management for confined canine operations including commercial kennels, hunt clubs, veterinary operations, animal shelters, etc.

- Hunt kennels often compost waste and/or spread it on fields.

- **Recommendations:**
  - Compile a database of all confined canine operations, identifying their locations and waste management practices;
  - Develop an informational brochure detailing proper pet waste management to be distributed by veterinary offices, local SPCAs, hunt clubs, dog licensing offices, etc.;
  - Develop and implement educational/outreach programs to inform the public of appropriate pet waste management practices;
  - Install pet waste management stations at The Link in Sperryville, the public park in Washington and other identified public dog-walking locations;
  - Provide information on, and encourage the use of, private dog waste enzyme digesting composters.
  - Determine how existing confined canine operations are currently handling waste and promote those with appropriate management systems while working to improve those with problematic techniques.
  - Develop a model pet/kennel waste management ordinance for consideration and adoption by all localities.

- **Cost-Share/Potential Funding**
  - EPA Environmental Education grants might be explored as a source of funds for:
    - The development and distribution of informational materials by Realtors;
    - The development and implementation of educational materials for students and the general public.
  - Sources of potential funding for educational programs, informational; brochures, and demonstration projects include;
    - Water Quality Improvement Fund
    - Rural Community Assistance Program
    - Chesapeake Bay Foundation
    - National Fish and Wildlife Foundation

APPENDIX G

Livestock Exclusionary Streamside Fencing Maps

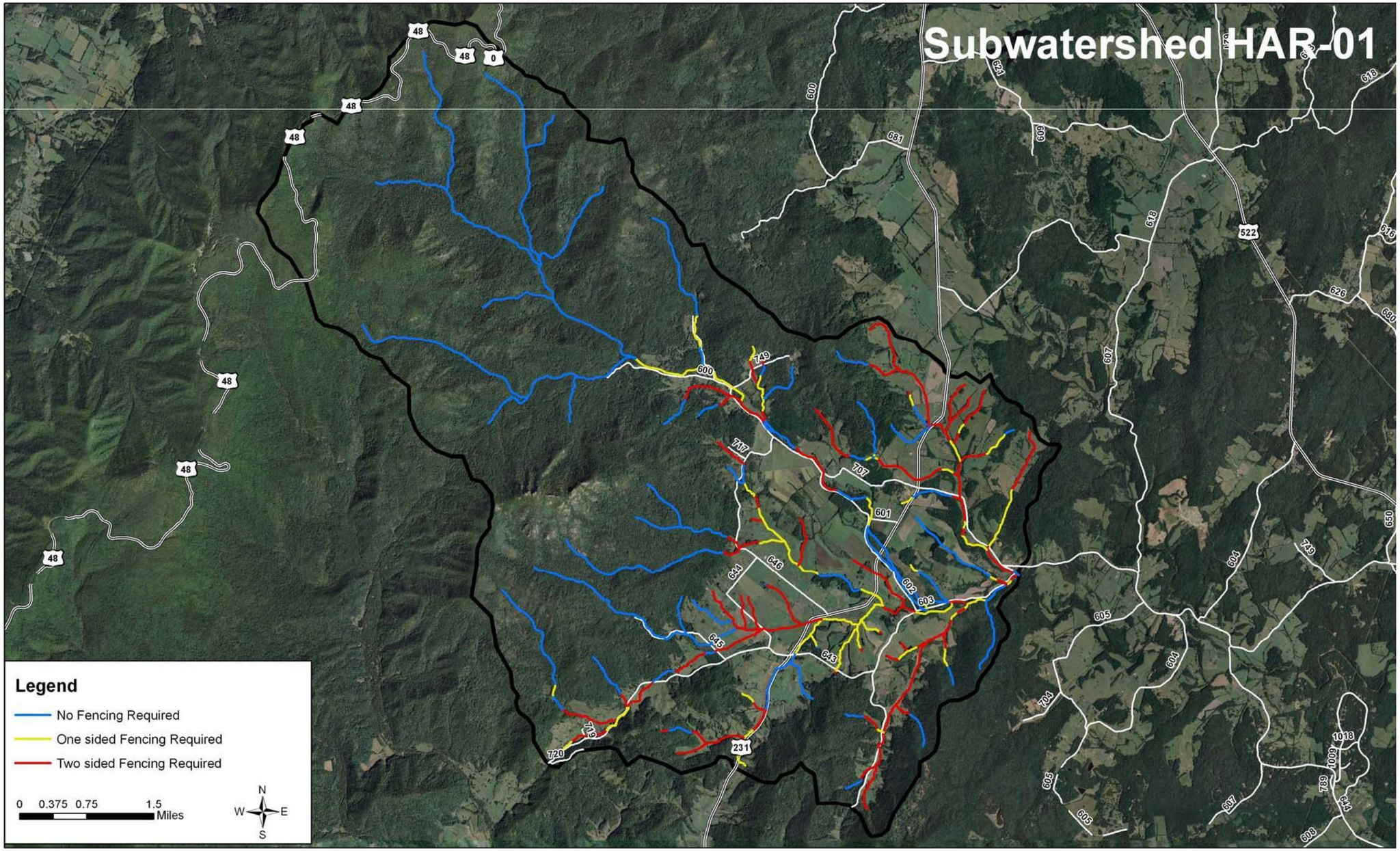

Figure G.1. Livestock exclusionary fencing estimated for subwatershed HAR-01.

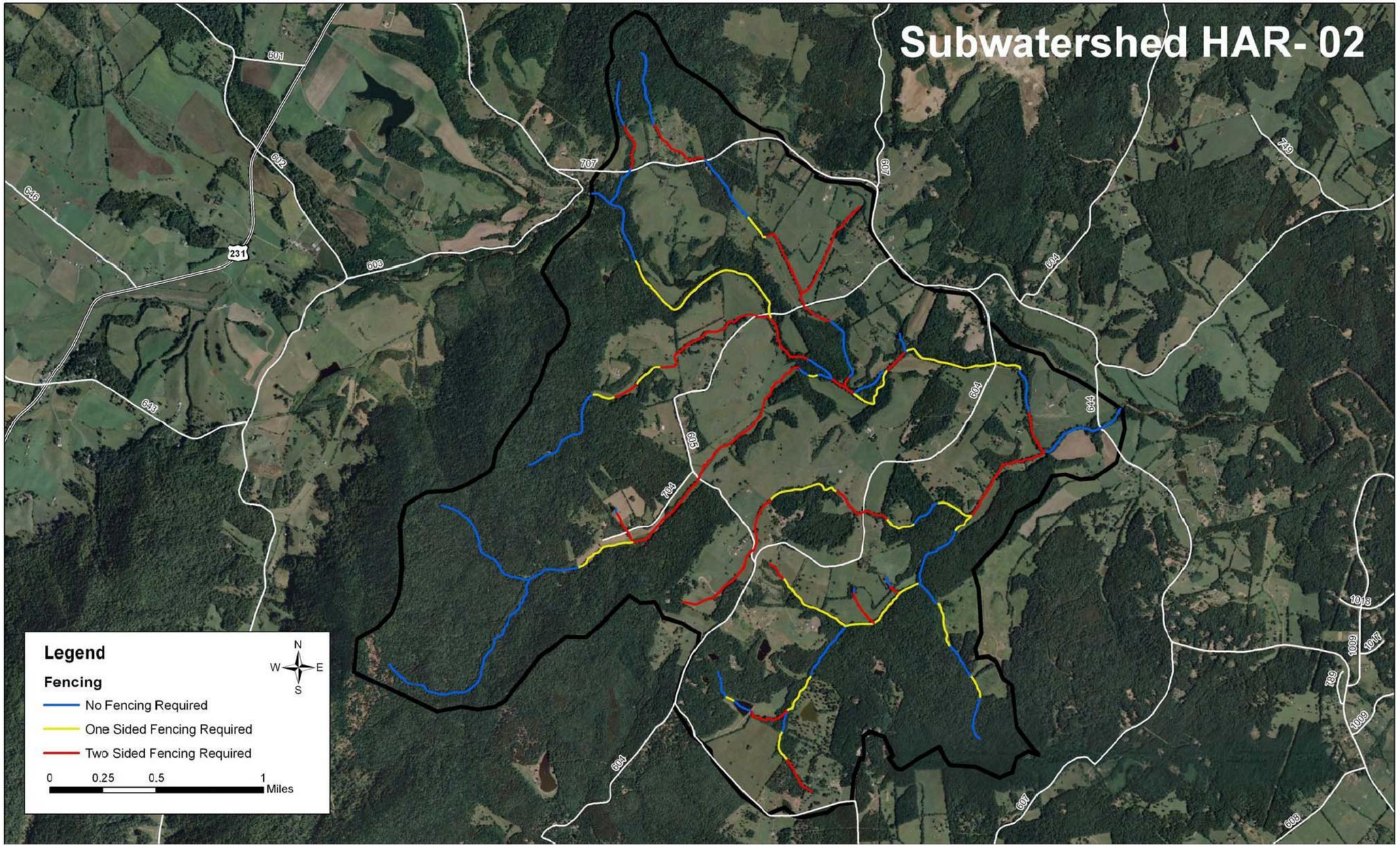

Figure G.2. Livestock exclusionary fencing estimated for subwatershed HAR-02.

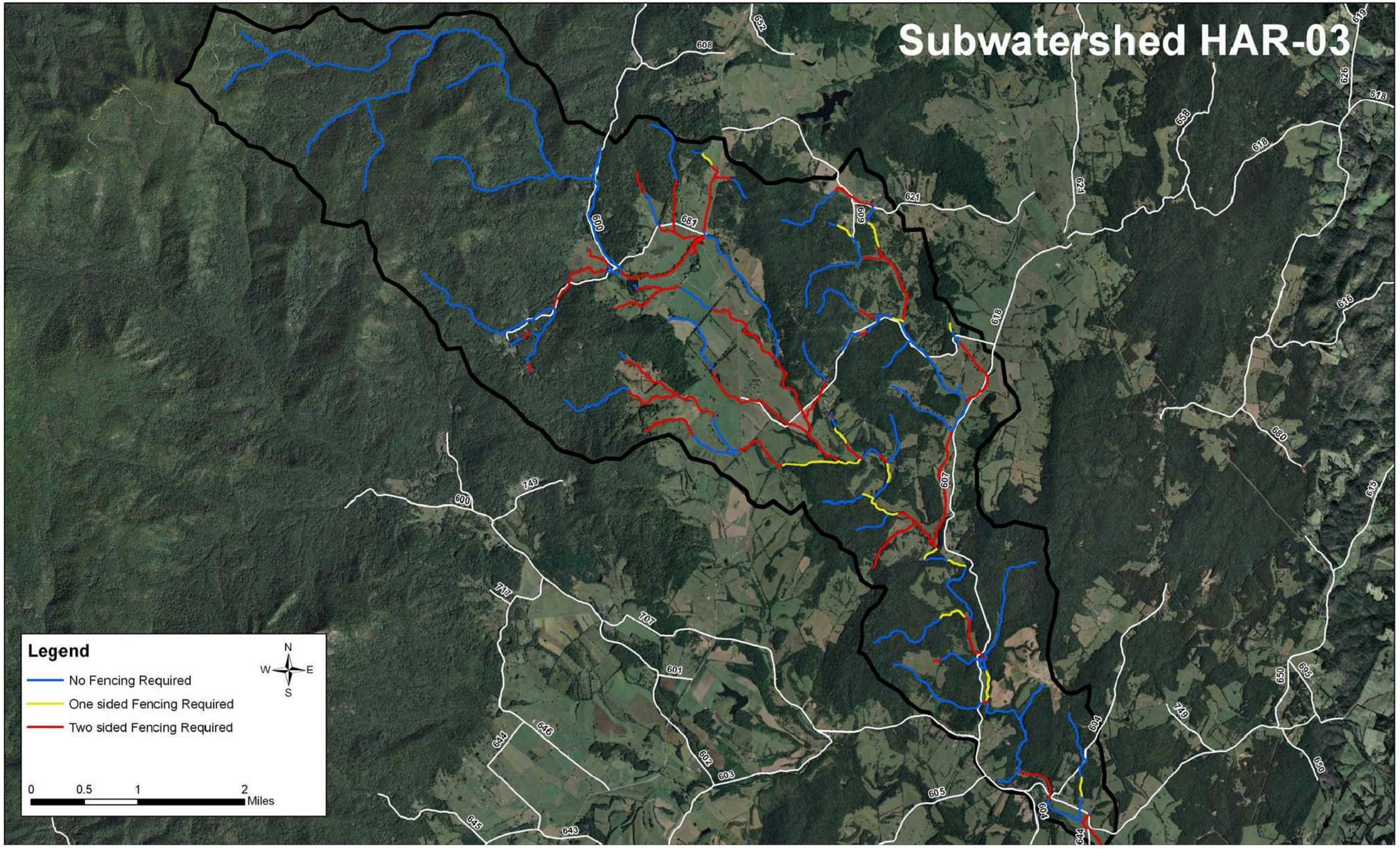

Figure G.3. Livestock exclusionary fencing estimated for subwatershed HAR-03.

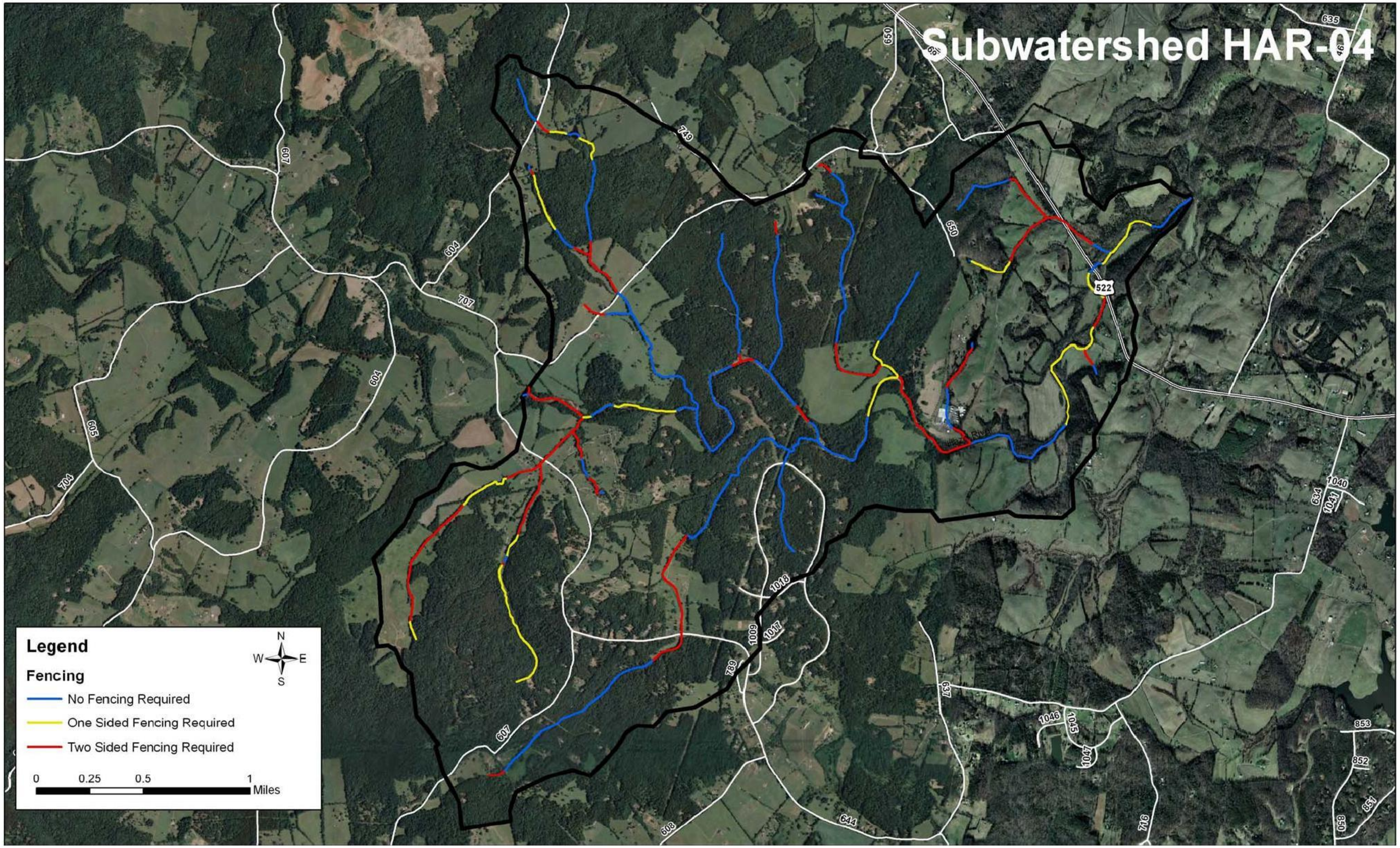

Figure G.4. Livestock exclusionary fencing estimated for subwatershed HAR-04.

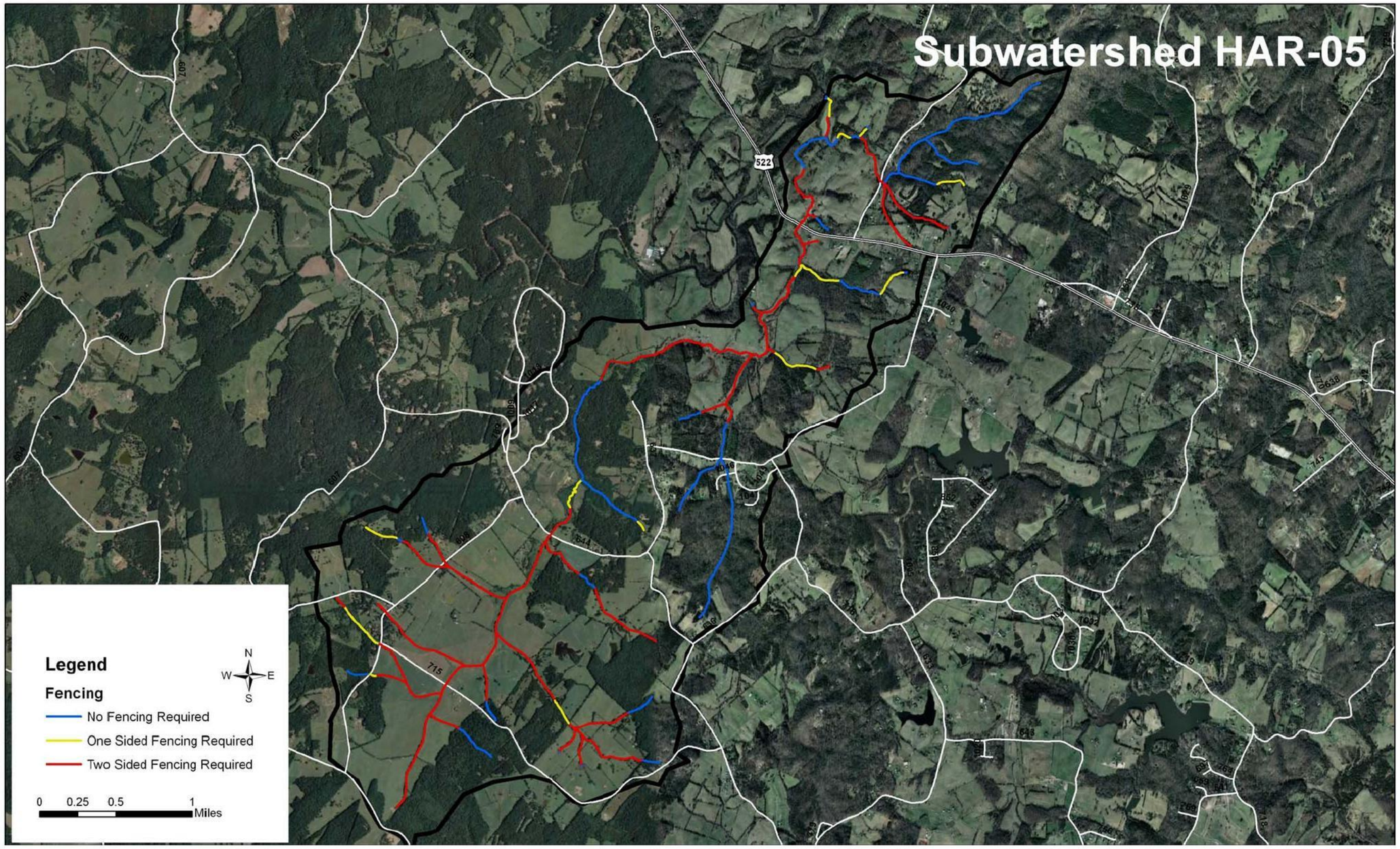

Figure G.5. Livestock exclusionary fencing estimated for subwatershed HAR-05.

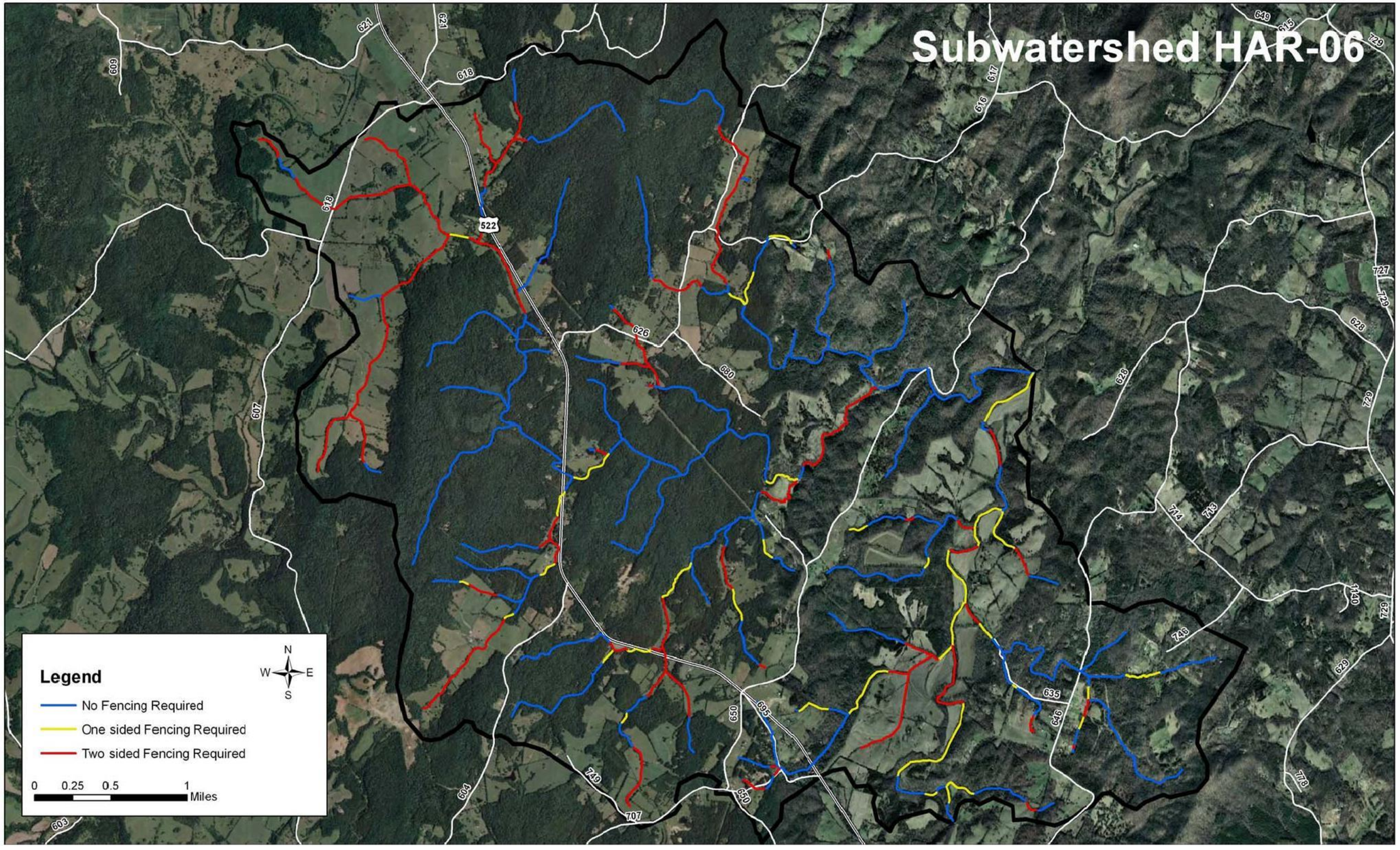

Figure G.6. Livestock exclusionary fencing estimated for subwatershed HAR-06.

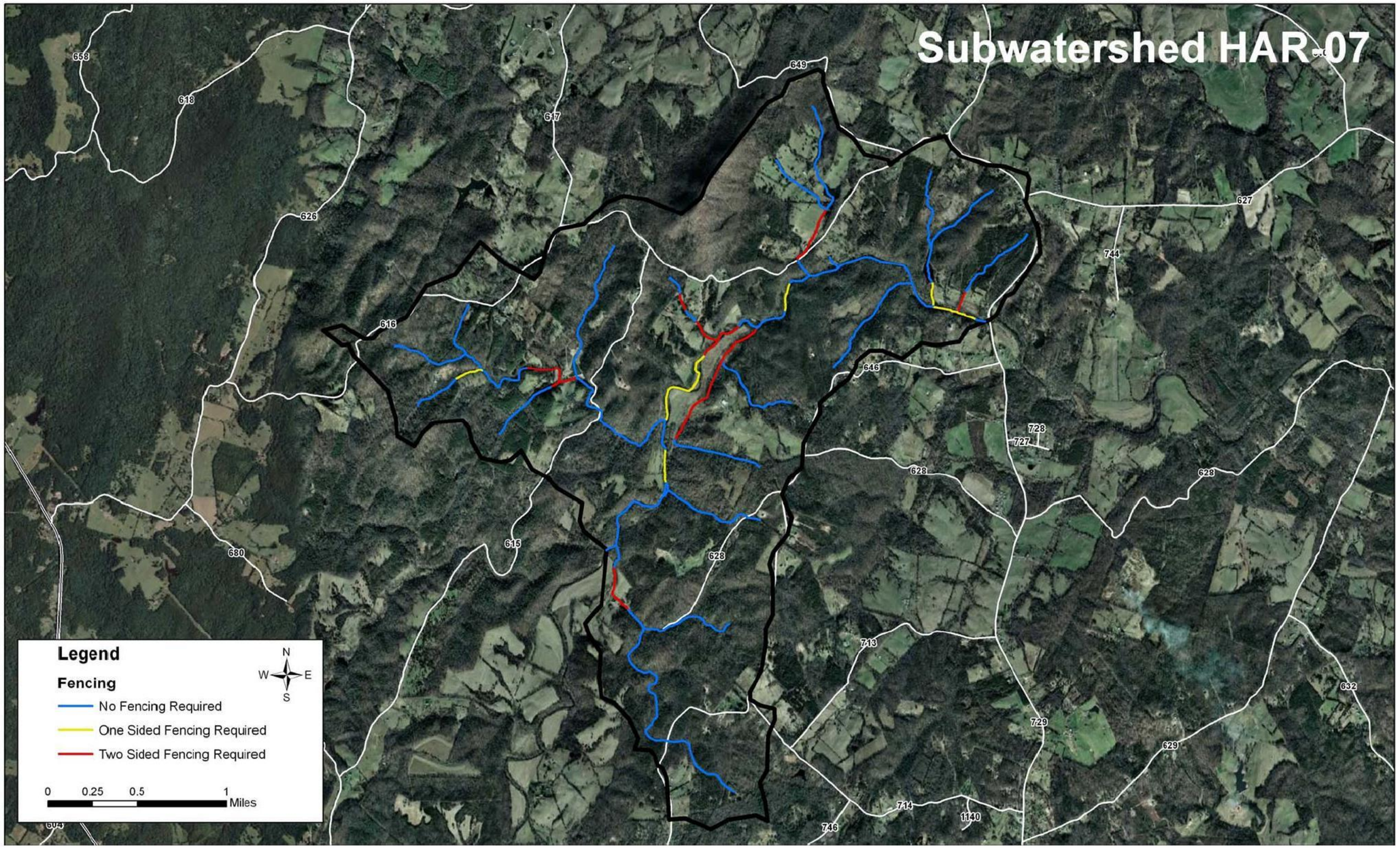

Figure G.7. Livestock exclusionary fencing estimated for subwatershed HAR-07.

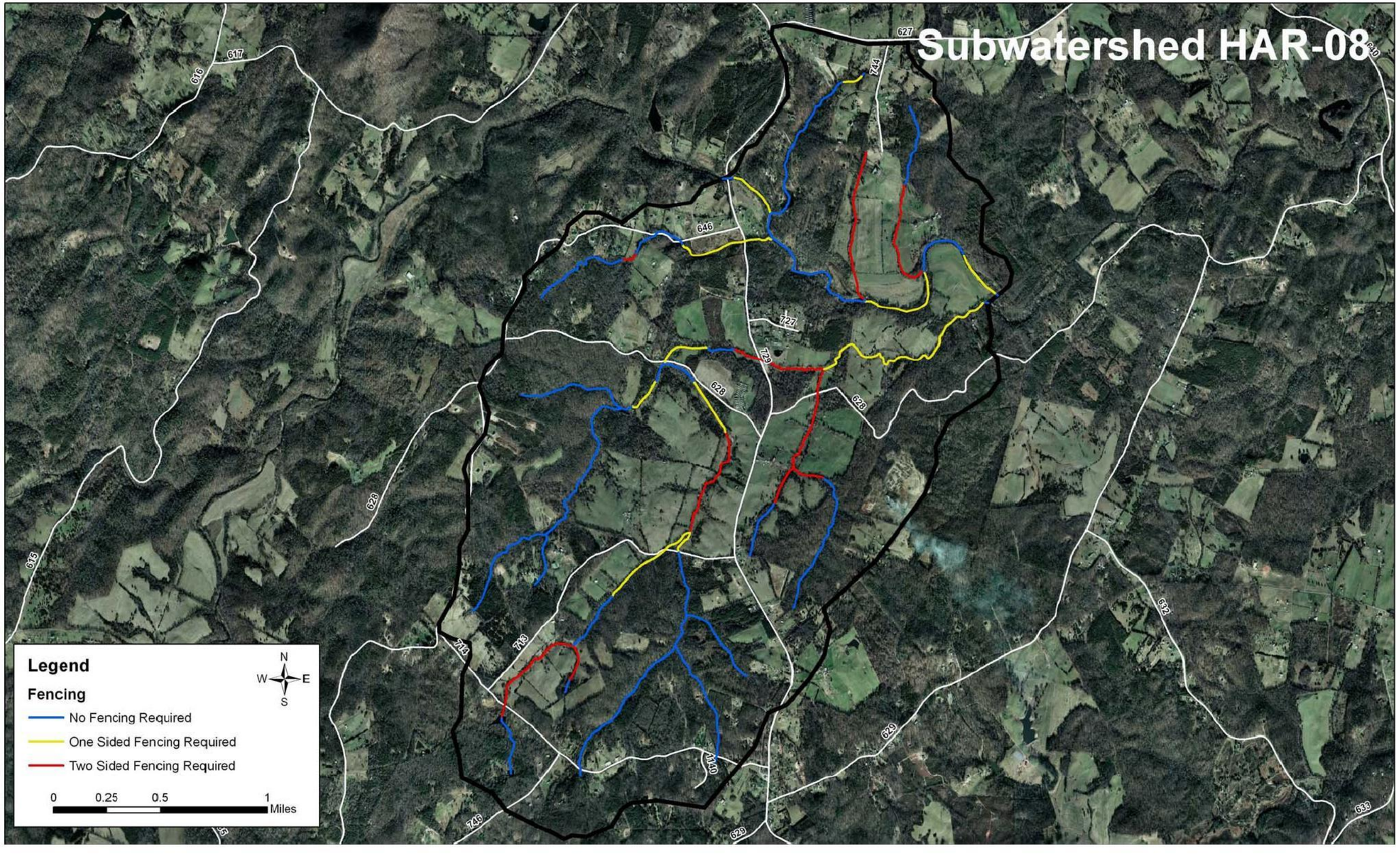

Figure G.8. Livestock exclusionary fencing estimated for subwatershed HAR-08.

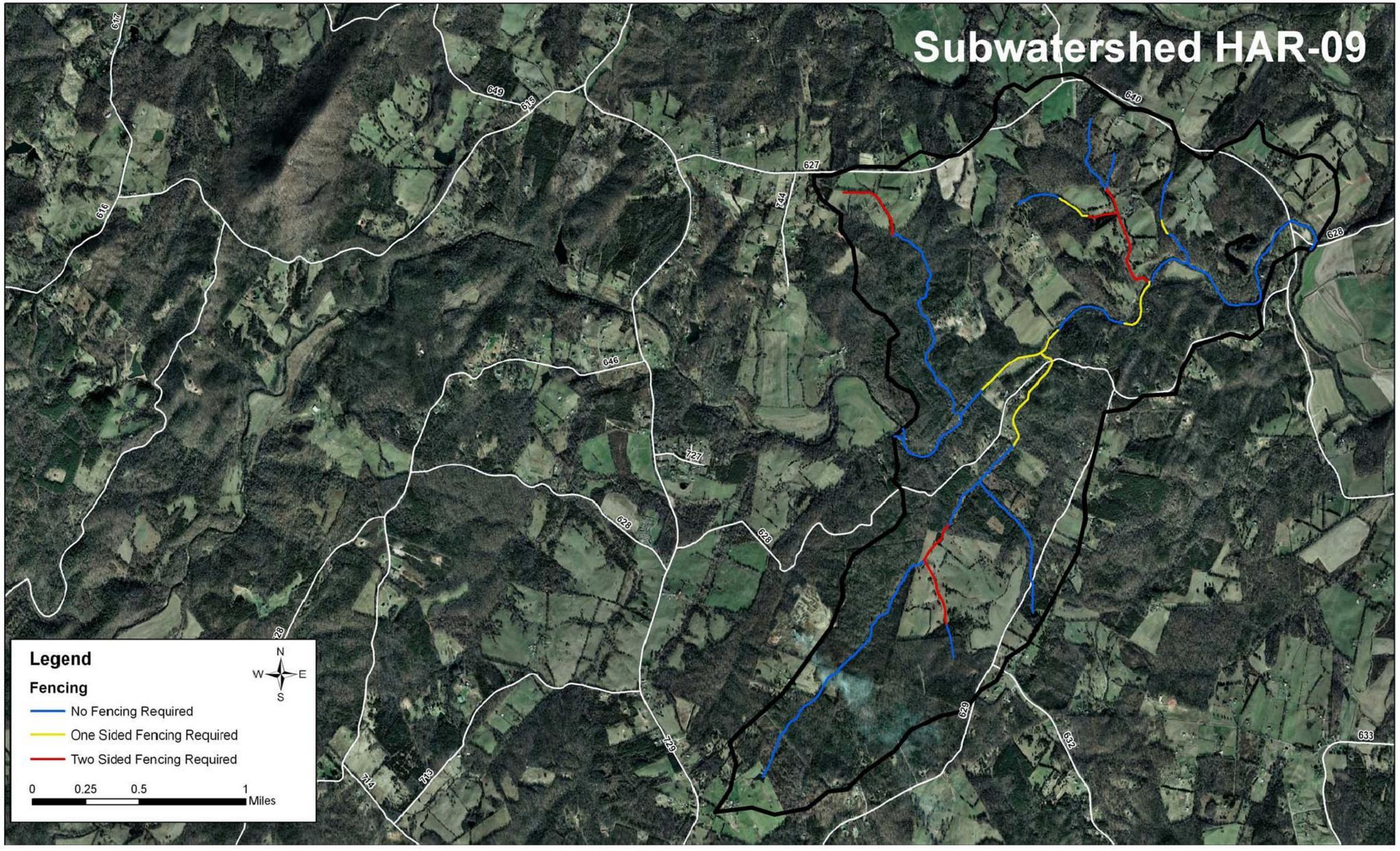

Figure G.9. Livestock exclusionary fencing estimated for subwatershed HAR-09.

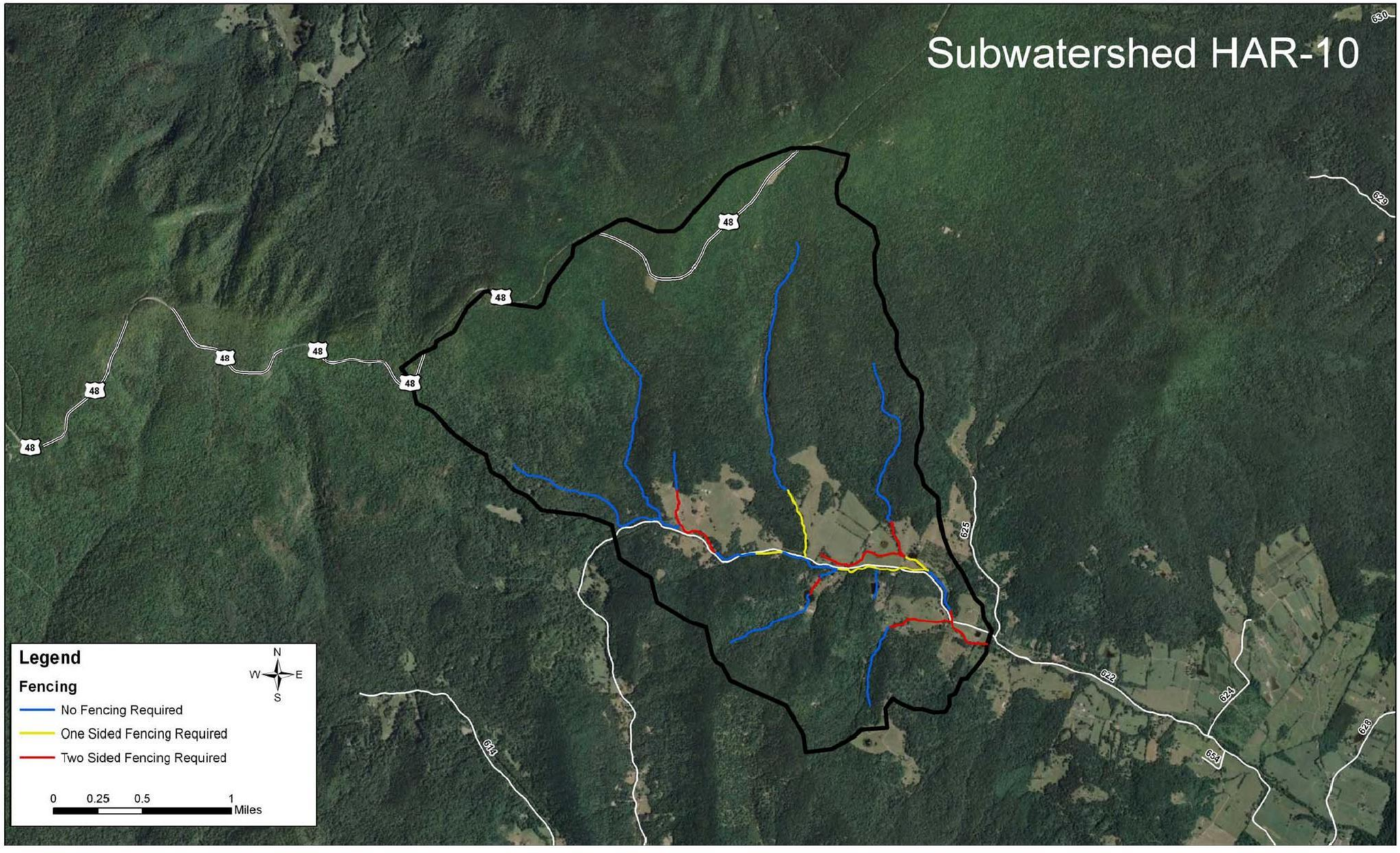

Figure G.10. Livestock exclusionary fencing estimated for subwatershed HAR-10.

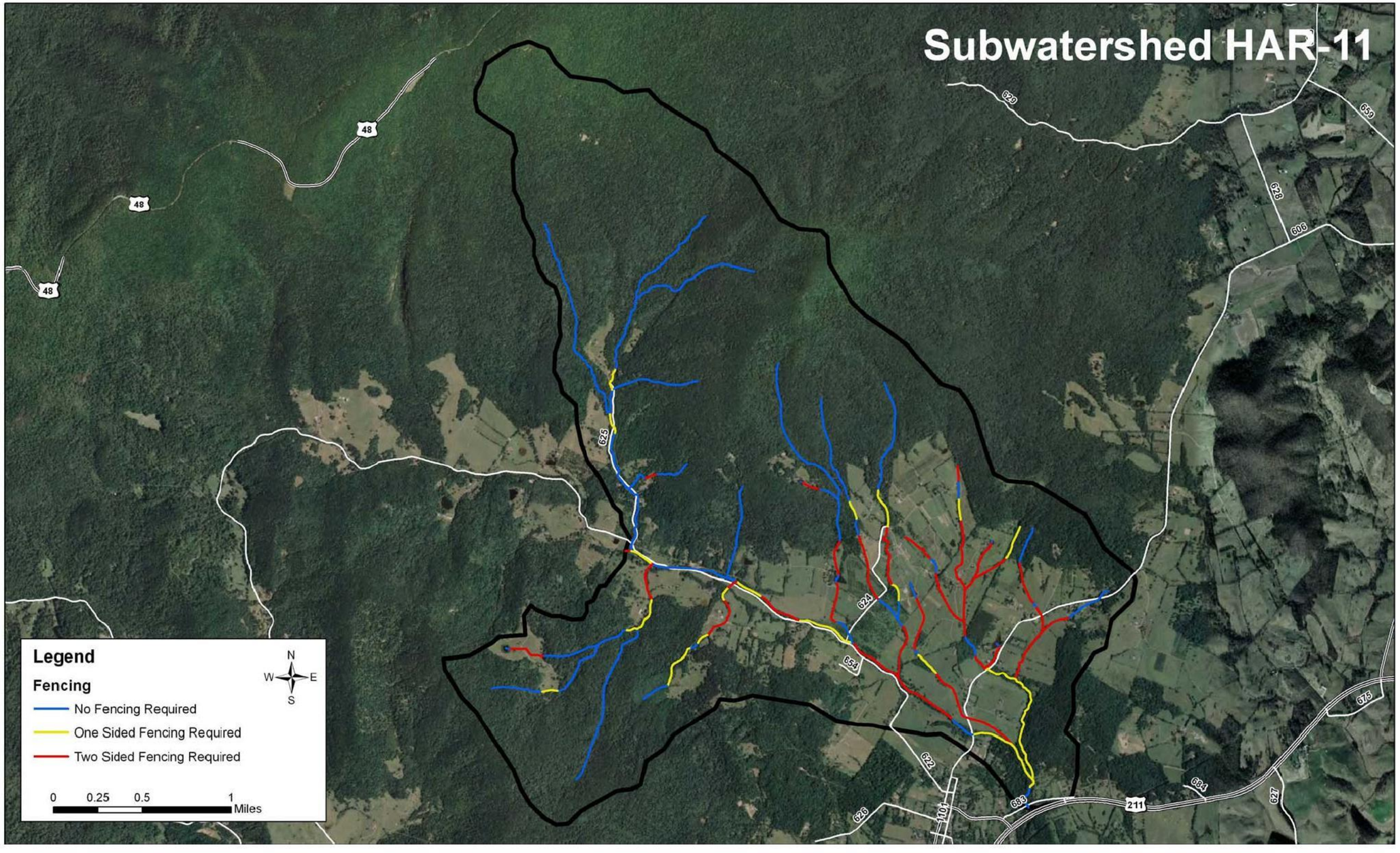

Figure G.11. Livestock exclusionary fencing estimated for subwatershed HAR-11.

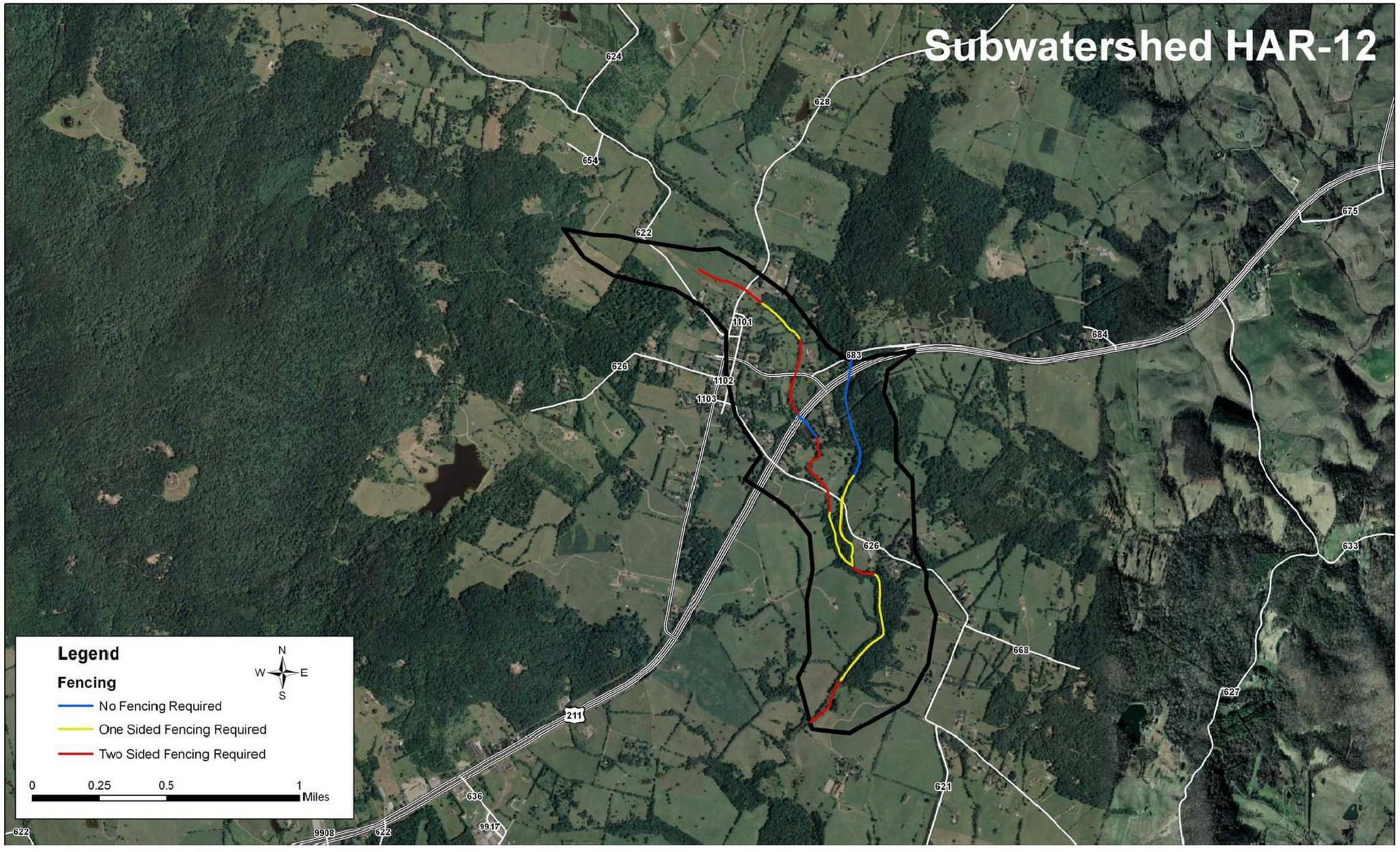

Figure G.12. Livestock exclusionary fencing estimated for subwatershed HAR-12.

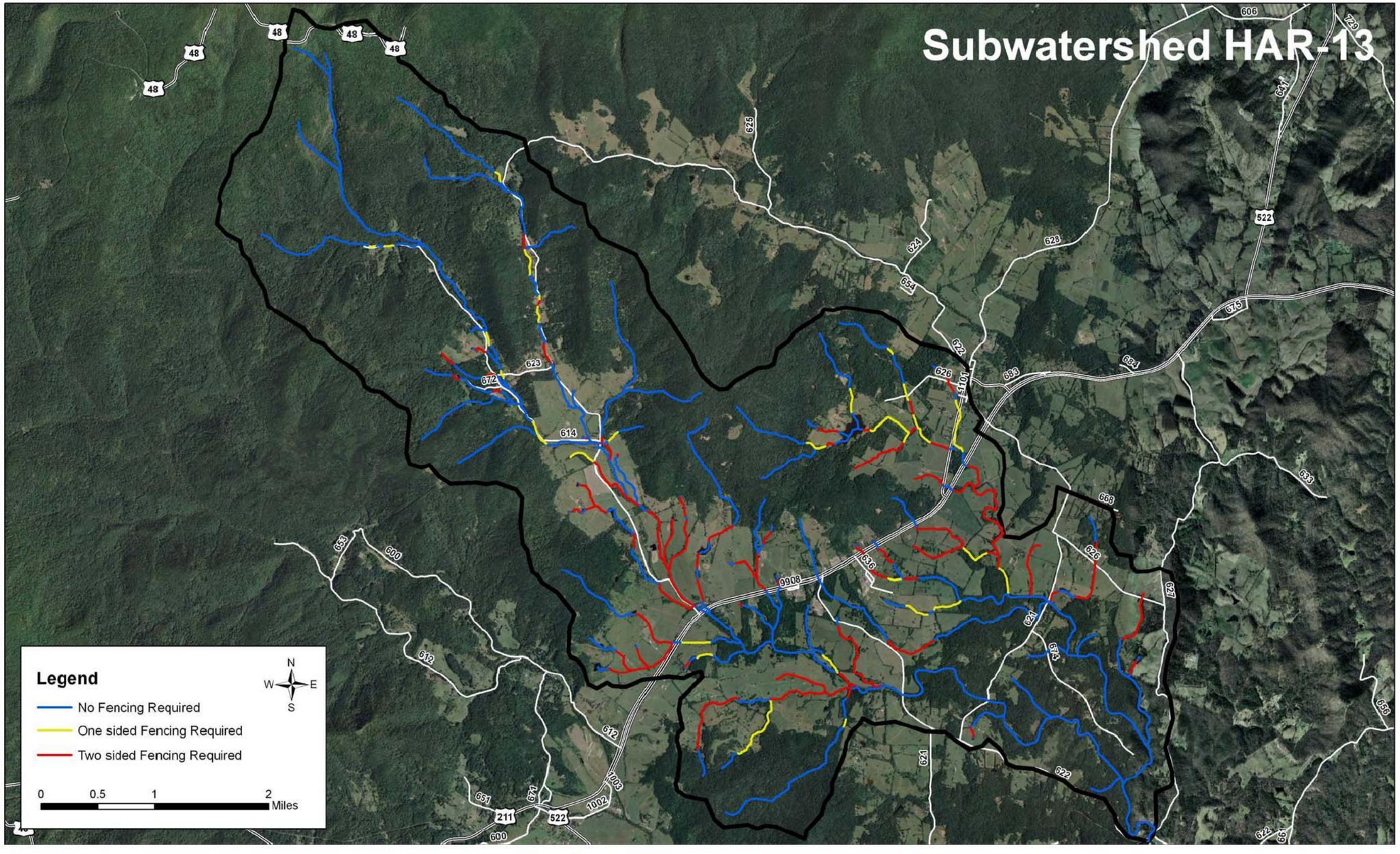

Figure G.13. Livestock exclusionary fencing estimated for subwatershed HAR-13.

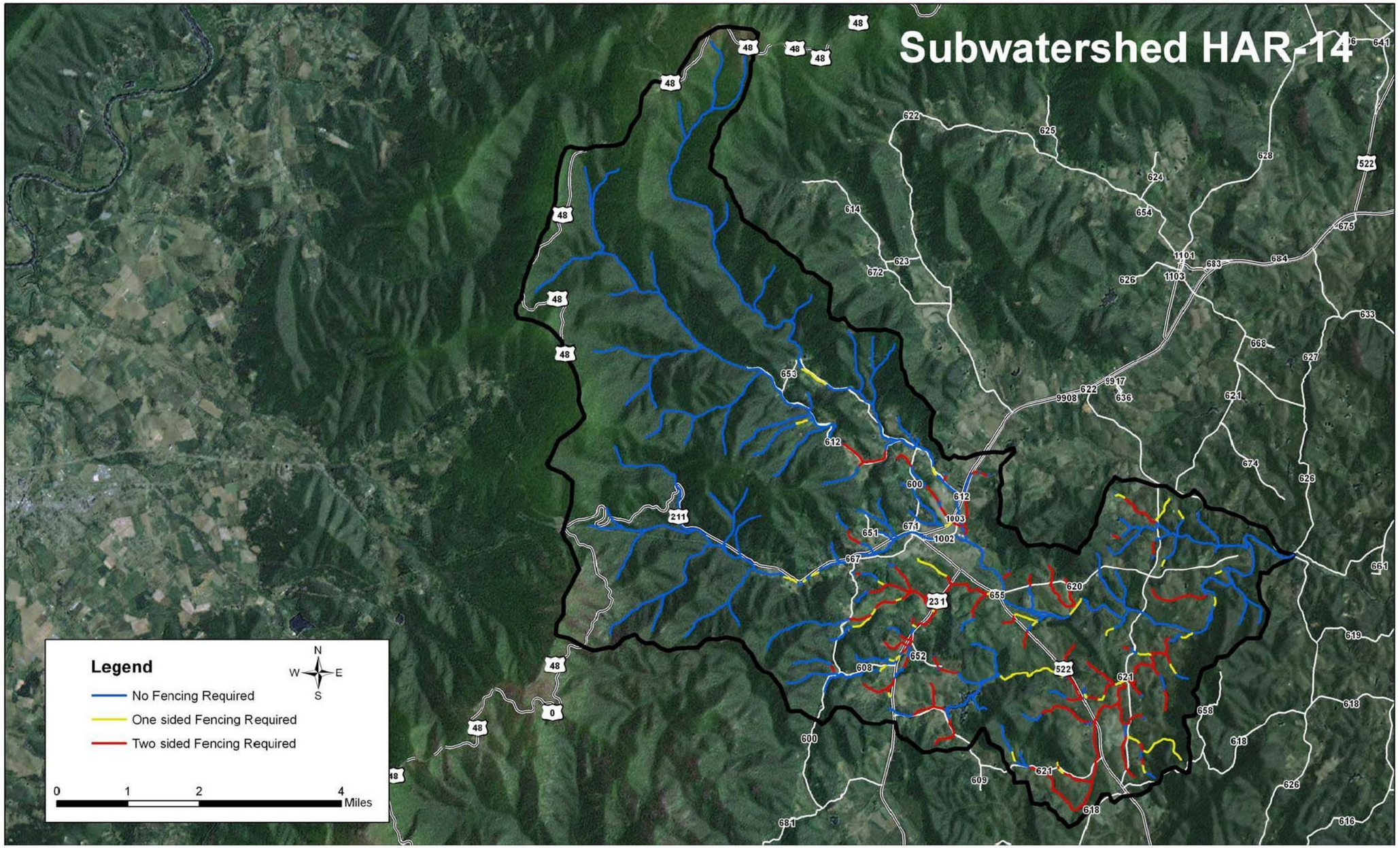

Figure G.14. Livestock exclusionary fencing estimated for subwatershed HAR-14.

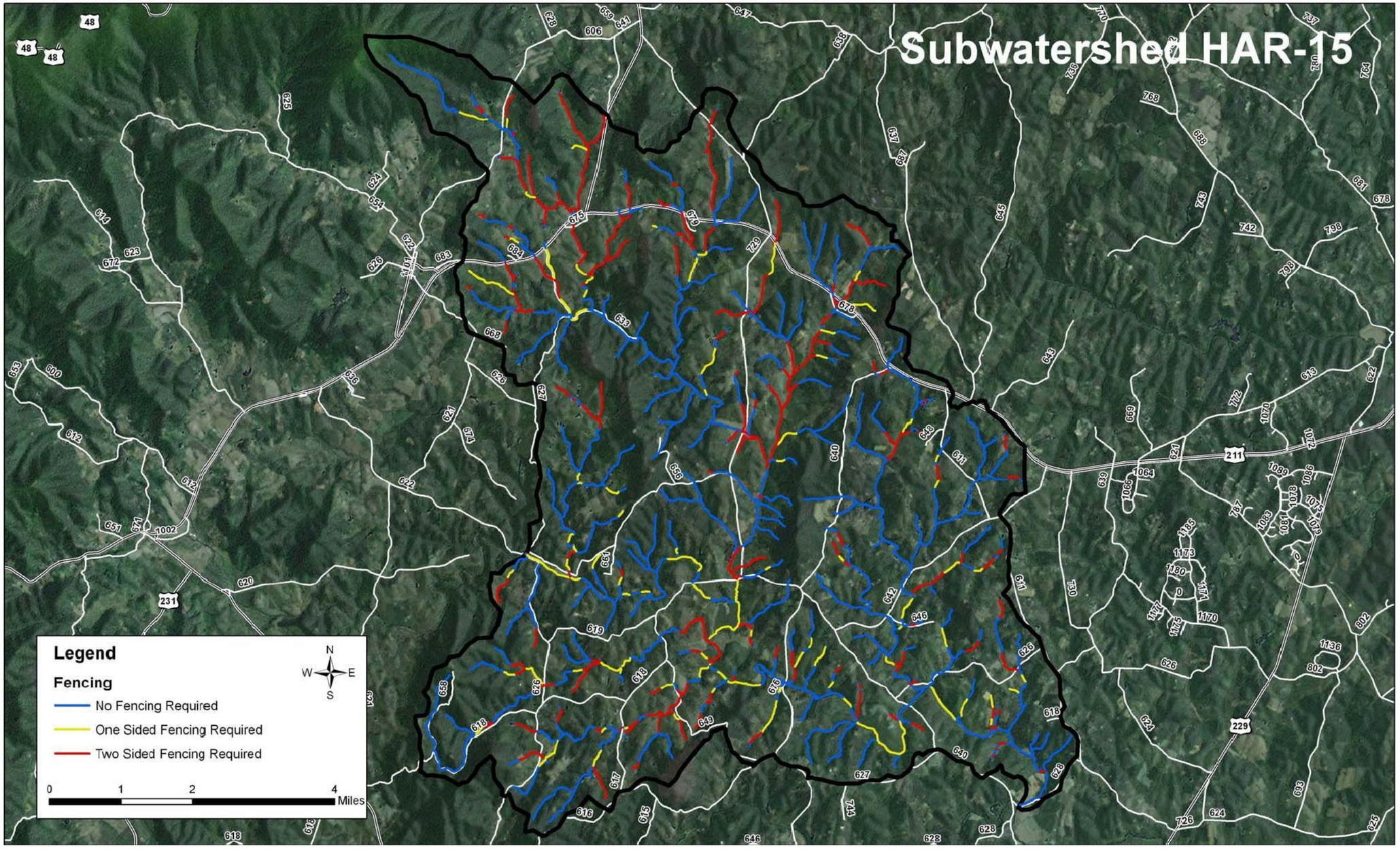

Figure G.15. Livestock exclusionary fencing estimated for subwatershed HAR-15.